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U. S. NAVAL INSTITUTE.

SECRETARY'S NOTES.

The Prize Essay, 1913.

The Board of Control, at its regular meeting on February 6, 1913, discussed the twelve essays submitted in the Prize Essay Competition. It was voted to award the prize of two hundred dollars, life membership in the Institute and a gold medal to Lieutenant Commander Harry E. Yarnell, U. S. Navy, for his essay, "The Greatest Need of the Atlantic Fleet." To Commander Yates Stirling, Jr., U. S. Navy, was awarded first honorable mention and one hundred and eighty dollars—thirty in lieu of life membership, as he was already a life member—for his essay, "Navy Department Administration: A Study of Principles." Second honorable mention, together with one hundred and twenty-five dollars, was awarded for the essay, "Trained Initiative and Unity of Action," written by Lieutenant Commander Dudley W. Knox, U. S. Navy. The essay by Commander Stirling will be published in the June issue. The above action indicates a change of policy as to the amount of the awards assigned to essays receiving honorable mention. Attention is invited to the notice relative to the Prize Essay Competition, 1914.

Special Notice to Members.

It is believed that the interest and scope of the essays and articles published in the PROCEEDINGS can be continued and improved, and you are cordially invited to assist in this work. Should any topic occur to you on which you believe an essay or article should be written, or on which you would like to read one, send such topic to the Secretary at once. These topics will be published in the PROCEEDINGS as suggested, desirable ones for essays and articles, and thus many essays and articles on a wide range of subjects may be obtained.

Topics Suggested by Members.

The insertion of the preceding paragraph in the December PROCEEDINGS resulted in the following suggestions:

The Present Status of Prize Law.

The Attack of Coast Fortifications.

Radio Signalling for the Navy During War: Its Advantages and Limitations.

It is hoped other suggestions will be forthcoming. Authors of essays are informed that the Institute always obtains the authority of the Department to publish their essays before printing them in the PROCEEDINGS.

Membership. Since the annual meeting, 110 new members, regular and associate, have joined the Institute. Six members have resigned, and the following members have died:

Rear-Admiral P. H. Cooper, U. S. N.,
Lieutenant C. D. Galloway, U. S. N.,
Naval Constructor F. D. Hall, U. S. N.,
Commodore J. K. Patch, U. S. N.,
Pay Director G. W. Simpson, U. S. N., and
Professor A. Werner Cronquist.

All members are urged to increase the membership of and the interest in the Institute by obtaining new members and by writing or urging others to write for the PROCEEDINGS.

Publications. The Institute has recently reduced, as far as possible, the prices charged for its publications in the hope that their sales will be increased thereby, and that members and purchasers will feel that only the necessary profit is being made.

New Publications. "A Practical Manual of the Compass," by Lieutenant Commander Harris Laning, U. S. N., will prove of great value to navigators and to officers studying for their examinations for promotion. It has been adopted as a text book for midshipmen of the first class. It is a compilation of the best practical material on the errors of the compass and how to compensate them. All of the mathematical theory has been omitted, but there is sufficient explanation of cause and effect to make the principles clear to the student. The book contains all the most recent data on the subject of compensation of the compass as well as copies of all the forms used in compass work, with an explanation of how to use them. It has in it everything the practical navigator needs to know about his compass work.

"The Recruit's Handy Book" has been completely revised and brought up to date—February 15, 1913—by Captain W. F. Fullam, U. S. Navy.

The "Blue Jacket's Manual" has been corrected so that its chapter on signals is in accord with the various changes recently made. It is expected that Lieutenant Commander McLean will completely revise it in the spring of 1914.

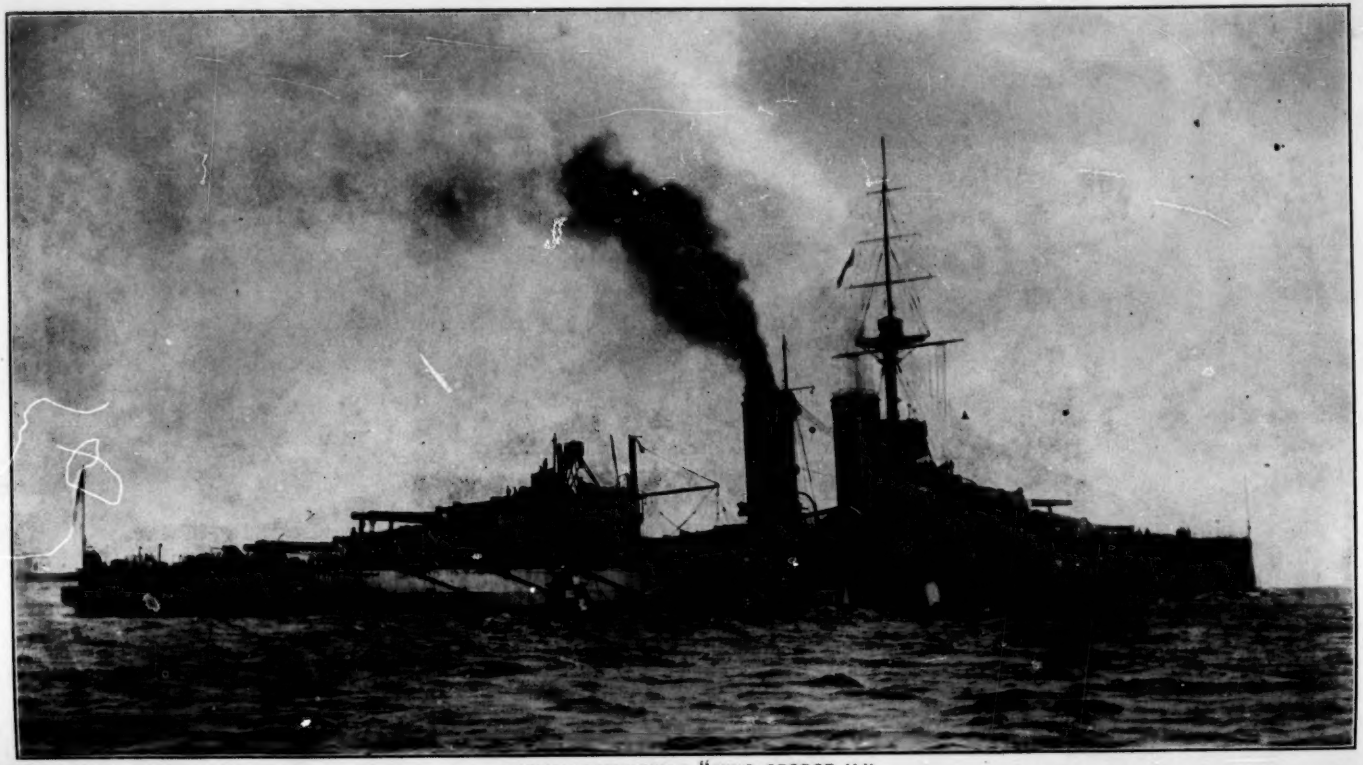
The "Ship and Gun Drills, 1907," is undergoing a thorough revision by the Department, as is also the "Boat Book." Purchasers of the latter will be furnished a leaflet correcting the signal chapter. A complete revision of the Boat Book by Rear-Admiral Seaton Schroeder is expected in November.

Discussions. In view of the distinct revival of interest in the matter of fleet fighting efficiency, attention is called to two articles by Rear-Admiral Dillingham: the first, "Flag Officers in the United States Navy," which appeared in the PROCEEDINGS for December, 1911; the second, "Training of the Personnel of the Fleet for Battle," which appeared in the PROCEEDINGS for March, 1911. Discussion of these essays is invited in the pages of the PROCEEDINGS.

Addresses of Members. For members in the Navy and Marine Corps the addresses given in the Official Directory are used. Other members are requested to keep the Secretary notified of their correct addresses.

Library. At the office of the Institute there can be found a full set of the PROCEEDINGS, all its publications, many books of professional interest, and copies of the foreign and home monthly service periodicals. Members are invited to make use of these at all times.

ANNAPOLIS, MD., FEBRUARY 20, 1913.



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ENGLISH BATTLESHIP "KING GEORGE V."

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

Prize Essay, 1913.

THE GREATEST NEED OF THE ATLANTIC FLEET.

By LIEUT.-COMMANDER HARRY E. YARNELL, U. S. Navy.

Motto: "Know Thyself."

Owing to the fact that naval development lay dormant in the United States for many years after the Civil War, the Atlantic Fleet is a result of comparatively rapid and recent growth, and its present size and power are a source of pride. It is not believed that the types of vessels built at present are surpassed in offensive power by those of any other country. The efficiency of the personnel is assumed by the nation to be of a high standard, judging from the expressions of opinion in the press, and the existing confidence in its capability is most gratifying to the service.

The best judge, however, of whether such confidence is merited or otherwise is the navy itself, for it possesses the technical knowledge sufficient to determine, not only what the fleet is capable of accomplishing in time of war, but also the extent of the preparations and training that exists in the navies of foreign powers.

To a great extent efficiency is a matter of comparison, and until we of the navy can feel that our preparedness for war with any probable enemy is as complete as our best efforts can make it, the pleasing articles in the current press should not be allowed to blind us to shortcomings if they are found to exist, or to the prompt adoption of steps for their removal.

For many of the ideas in the following article the writer can claim no originality. They have been acquired in conversation and discussion with brother officers who have given the subject much consideration and who have appreciated the lost motion that is believed to exist in the Atlantic Fleet, in the endeavor to produce the state of preparation that will be found necessary on the day of the supreme test.

The greatest need of the fleet to-day is a carefully prepared schedule of operations, or routine of work and play, giving due consideration to all the elements which enter into fleet efficiency.

If the statement is made and accepted that there is something vitally necessary which is lacking at present, in the routine of the fleet, it is but natural to assume that its efficiency can be increased if present conditions are changed, and it is believed that this assumption is correct.

To the question "Are we ready to go to war to-morrow with a first-class power?" it will require a radical optimist to answer in the affirmative; and if it is still further asked in what particulars the fleet is subject to improvement, the reply may be:

Can it carry out the movements and scouting that are necessary before contact with the enemy, with the confidence that is born of training under actual conditions of sea and weather, and with the assurance that such maneuvers are in accord with the best practice, so far as can be determined in time of peace?

Is there a plan of battle approach which has been decided upon, through actual experiment, as the best that can be devised?

In time of war will battleships be defended against torpedo attack according to present conventional methods, or will a radically different plan be employed?

Are torpedo-nets required or are they not?

Are serious efforts being made to develop a system of signals that can be used in battle with a reasonable probability of success?

Is there co-ordination between the fleet and the War College?

Is the staff of the commander-in-chief organized for other than routine and administrative duties in time of peace?

Is the internal organization and routine of a battleship such as to produce the best results?

Is the personnel being trained to the best advantage?

If the answer to any of the above questions is other than affirmative, it behooves the line of officers of the navy to devote their best energies towards bringing to the highest possible perfection

the instrument already in their hands. Wars come suddenly in these uncertain days, and remote as they may appear, as far as the United States is concerned, the only sound basis for the navy to assume is that hostilities are imminent and to prepare accordingly. The immensity of the stake permits of no other assumption.

In gunnery, systematic and serious work has been and is being done to raise the standard, and the results are a matter of pride. Much remains to be accomplished, but compared with other elements of naval efficiency, gunnery is far ahead. The present skill in gunnery is due:

(a) To a keen realization of its original and present defects.

(b) To a careful and systematic planning of methods by which these defects are to be overcome.

(c) To trained personnel.

(d) To improvement in material brought about by increased skill of personnel.

"Scientific management" existed in the gun crews of the navy several years before it became so widely advertised in the press. It is probable that efficiency in gun drill and target practice led to the praise given the general efficiency of the fleet by the board of civilian experts on management, whose members spent a short time on some of the ships of the fleet a couple of years ago. Such praise, coming as it did from civilians who are not well informed on all the elements that enter into military preparedness, is of little value.

FLEET MANEUVERS.

During the past year and a half, three rather comprehensive maneuvers were planned, and two of them were abandoned on account of rough weather. From what was accomplished, it was found that the game-board and actual conditions do not always co-ordinate, and defects were brought to light in several of the ships that had been previously unsuspected, due to cruising mostly in fair weather. More maneuvers were not carried out on account of lack of time.

This record, however, is no worse, and perhaps better than that of preceding years. The so-called maneuvers of past years consisted of elementary search problems or "drill book tactics." In 1903 two search problems were carried out; in 1904 a search problem, and some combined army and navy maneuvers; in 1910 a search problem.

In July and August, 1912, the battleships, destroyer flotilla, and

submarines engaged in a series of exercises from which valuable experience was gained. Unfortunately, these exercises were somewhat curtailed, owing to an insurrection in Cuba, but they excited great interest in all engaged, and pointed the way to further work.

The effect that conditions of weather, and reliability of material will have on problems that have been planned on the game-board still remains to the fleet a sealed book. In this connection it is believed that the tendency to seek mild weather and smooth seas for the work of the fleet is conducive to inefficiency. It takes hard knocks and rough weather to develop both personnel and material. The high standard of efficiency in the Revenue Cutter Service is due, no doubt, in part to the amount of cruising done under all conditions of wind and weather. During the winter months on the North Atlantic, the cutters are standing by to render assistance to distressed vessels under the most difficult circumstances.

So little cruising is done by naval vessels in cold weather that the old-time types of heavy flannel underclothing and woolen socks are no longer carried by the paymaster, since they are no longer in demand. If the fleet is ever required to carry out a winter campaign under conditions that existed off Port Arthur during the Russo-Japanese War, the present type of heavy clothing carried for the men probably will be found most inadequate.

BATTLE APPROACHES.

The number of times that the fleet has been exercised at battle approaches does not greatly exceed the number of attempted grand maneuvers. The formation and tactics by which a fleet is to be led in battle against an enemy are by no means settled. Is it to be battle plan *X* or battle plan *Y*? Many opinions are expressed, but how can any of them be sound when they are not based on results that have been obtained in actual drill with the fleet?

A certain officer has a method of battle approach by which he can defeat a greater number of vessels, on the game-board, provided a certain standard of signalling is assumed. This method is unfavorably reported on by the War College. Later one of the officers of the War College is converted to a belief in it by conversing with the originator. It has not yet reached the fleet. In the above, which is an actual case, the value or otherwise of the proposed method is of no moment in the present argument. The point that it is desired to bring out is that such a scheme is not seized upon with avidity by the fleet, discussed, dissected, analyzed,

and tried out under actual conditions. What could be of greater interest than any proposed method of so maneuvering as to gain the advantage before gun-fire begins?

By the frequent exercise of squadrons acting against each other and maneuvering for position under battle conditions of speed and signalling, far more valuable experience will be gained than by any amount of time spent in the "evolutions" unfortunately shown in our signal books, assisted by speed cones, stadimeters, swarms of signalmen, and other aids that will be impracticable in action. In the minds of many officers to this day "fleet tactics" consist of the signal book diagrams.

DEFENSE AGAINST TORPEDO ATTACK.

At the present time the method that will be employed in actual hostilities to defend the fleet against torpedo attack is in a very nebulous state. The conventional method of turning on all searchlights and cutting loose with the small-caliber battery has lost its charms, due to long-range torpedoes and the limited range of search-lights. A suspicion has also been awakened that the searchlights are of considerable assistance to the attacking vessels, which is deplorable if true, and which is worthy of close investigation. Questions are also being asked as to why the United States is the only one of the great naval powers that has consistently refused to employ torpedo-nets. No doubt these questions have been stimulated by the sight of undiscovered submarines coming to the surface within a few yards of the attacked vessel.

The question of the best practicable method of defense against torpedo attack still remains to be solved, and it cannot be solved without long, consistent and consecutive work. Enough work has been done to lead one officer of high rank to state that after opposing nets for thirty years, he was at last converted to a belief in their necessity, and to many expressions of opinion that searchlights are useless—all of which tends to show that there is much more still to be learned.

THE NAVAL WAR COLLEGE.

The Naval War College has now been in existence for over twenty years. Its early life was somewhat precarious and was several times threatened with extinction; but it managed to survive, through the patient and persistent work of its adherents, and it stands to-day on a firm foundation, a splendid tribute to its

founder, Rear-Admiral S. B. Luce, U. S. N., whose keen, analytical mind has been devoted for so many years to the advancement of professional skill, and whose record in war and peace stands as a beacon-light to those who follow. The works of Admiral Mahan were the result of studies at the War College, and are accepted as classics in all countries.

What can be more intimately connected with the education of an officer than the work that is being done at the college—the conduct of a fleet in war and battle? It is the essence of all naval endeavor. Consequently it seems most remarkable that there has existed in the past, and exists to-day in the service, a certain amount of antagonism and opposition to the college.

This past and present antagonism is probably due to the following causes:

(a) The blue-water school of officers who hold honest convictions that the only place for training officers is on ships at sea.

(b) The theoretical graduate of the War College, who may know the art of war as taught by books, but who is unable to make a success of the practical duties of his profession. It is this class which, according to the blue-water school, is "unable to reconcile the turning circle of a swivel chair to that of a battleship."

(c) Failure on the part of the War College to advertise its aims and methods to the service, and to disseminate information.

It is a peculiar fact that while the United States was the first to establish a Naval War College, and to produce an author whose works on naval warfare are used as text-books in foreign navies, other nations have profited more from the example and teachings than our own.

The following extract taken from Admiral Makaroff's "Discussion of Questions in Naval Tactics," regarding the War College, is interesting:

> The first example of work in this direction [higher military training] was afforded by officers in the United States Navy, who in the year 1884 conceived the idea of establishing a higher naval and military school. The initiator of this work was Admiral Luce, whom the author met in the fall of 1896. In support of his assertions of the necessity of military training for naval seamen, Luce cited the example of the English generals Montague and Blake, who had commanded the English fleet. He said that the landsman with military training is more competent to control the military actions of the fleet than the professional sailor unacquainted with military science. He added that great military exploits can be expected for that fleet in which

the necessary scientific knowledge and skill in the art of conducting war are to be found combined with practical training, from early years, in all branches of the naval profession. Admiral Luce's representations were fruitful, and a Naval War College was opened at Newport.

The Americans in Relation to Scientific Investigations.—The Americans are a wonderful people. In no country are men more practical than in the United States, and it would seem to follow naturally that in the land of practical men a prejudice would exist against all kinds of theoretical and scientific work. But precisely the contrary is the case. The practical American considers science his helpmate.

The complete naval officer should combine the characteristics of (a) and (b). Unless an officer knows the varying moods of wind and weather, the capabilities of ships, guns and machinery; unless he is a student of human nature, and watches the health, happiness and efficiency of officers and men under his command—in other words, unless he is a seaman—he cannot be considered a success. And unless his plans and dispositions for a campaign, or his maneuvers in battle, are in accord with the principles of strategy, or the best ideas of tactics, he very probably will be a failure. The fleet and the War College can each do work for which the other is not fitted. Acting separately they are seriously handicapped. Acting together they can accomplish much toward increasing the efficiency of the fleet.

Many of the maneuvers and exercises of the fleet are repeated by different régimes, due to lack of knowledge of what has gone before. One of the duties of the War College should be to tabulate and summarize such work and publish it to the fleet, pointing out what was learned, and suggesting lines along which future exercises are to be directed. In this way a consecutive history of such work will be available to a new commander-in-chief and his staff. That such co-operation has taken place at one time is shown by the following extract from a report of the president of the War College, Captain A. T. Mahan, U. S. N., dated October 4, 1887:

> At the date of writing, the North Atlantic Fleet, under the command of Rear-Admiral Luce, is in port, and various practical exercises are now in course of arrangement under his orders, which will serve to illustrate and give point to teaching given orally in the lecture room, as well as diffuse information connected with the new material of the navy, more rapidly than could otherwise be done. Thus that squadron will co-operate with the ends of the college *in accordance with the original plan*,* and, it may be believed, to the benefit of the officers both of the fleet and of the class.

* Writer's italics.

The above is the only reference in official reports that the writer has been able to find of actual co-operation between the fleet and the War College. The present lack of co-operation is wasteful of effort, which, in machine-shop parlance, is "not in accord with the best modern practice."

ORGANIZATION OF THE STAFF OF THE COMMANDER-IN-CHIEF.

Whether the staff of the commander-in-chief, as at present organized, can perform the duties that will be required of it in time of war is open to serious question. It certainly cannot unless some or all of the members have passed through a course of training at the War College and can act as real assistants to the commander-in-chief in time of war. Most of the regulations (1909) governing the duties of the chief of staff are concerned with routine and administration. He passes his opinion on requisitions and leaves of absence; he keeps a journal of movements, a roster of officers, a record of signals; in fact, more space is devoted in the regulations to the manner in which the signal book is kept than to any other one subject. In a council of war he acts as recorder, and in time of battle he assists the flag officer "in every manner possible," keeping an eye on the signal record, and collecting data for his journal at the same time. If the regulations provided that he "assist the flag officer in every manner possible to prepare for battle," instead of waiting until the battle began, they would be more to the point, and the chief of staff might be of more value. It will be seen that the duties of the chief of staff are mainly administrative and clerical, and he is not considered in connection with the training of the fleet. The duties of the other members of the staff are mainly administrative.

Much of the correspondence that is now handled on the fleet flag-ship should never be allowed on board. Leaves of absence, records of summary courts martial and most requisitions should be handled by commanding officers subject to the general regulations on the subject. Routine reports are usually of little or no value. The regulation which requires certain papers to be passed upon by the "Senior Officer Present" may well be abolished. The "Senior Officer Present" is a variable who usually has no interest in the document. During the naval review in New York, in October, 1912, it was necessary for the commander-in-chief to give directions to hold the records of summary courts martial on

board the various ships until they were dispersed after the review, as it was impossible to handle them on the fleet flag-ship. This fully illustrates the absurdity of the regulation. But a handful of papers and a worried look will often gain a reputation for hard work if managed judiciously, and the tendency is to resist any curtailment of "Reports and Returns."

The duties of the staff in time of peace should consist principally of the following:

(a) Preparations of plans for maneuvers and exercises, and analyzing the results therefrom in conjunction with the officers of the fleet and the War College.

(b) Inspections of the units of the fleet.

The present conception of staff duty in the navy is very similar to that described by Upton in "The Military Policy of the United States," p. 262, as existing in the Adjutant General's Department of the U. S. Army at the beginning of the Civil War, from which the following is a quotation:

> But while success in the Supply Department did not demand previous military education, the same reasoning should not be applied to the Adjutant General's Department, whose officers in peace and war should possess a thorough knowledge of the military art. Unfortunately, our government has never deemed such requirements necessary, neither have the officers of the department thus far sought to rise above the mere drudgery of official routine.
>
> To issue orders, write letters, examine returns, grant furloughs, such is the conception in our service of the duty of the adjutant general.
>
> We often ridicule the apparent stupidity of foreign governments in placing members of the nobility in command of corps and armies, forgetting that if the commanders so selected have not been carefully educated, the government takes special pains to place at their side chiefs of staff able to perform all the duties of a general-in-chief. These chiefs of staff, together with all the officers subordinate to them in their own departments, have had the benefit of careful instruction at war academies especially designed for their instruction. Learning there all the principles of strategy and grand tactics and the importance of a knowledge of military geography, studying the theory of moving and directing troops in battle, impressed with the idea that their value as staff officers depends upon the assistance they can give to their generals in planning campaigns and fighting battles, they look with contempt upon any official occupation which may tend to degrade them to the position of a clerk. They, therefore, turn over the multitude of details relating to the proper work of the army to aides-de-camp, or officers detailed for this purpose.

From the striking resemblance between the duties described in the first part of the quotation and those at present specified in the

regulations concerning the staff, it will be seen that we are in the same relative position to-day as was the Adjutant General's Department of the army fifty years ago.

SHIP ORGANIZATION.

This is a subject regarding which it is not unreasonable to assume that all line officers are thoroughly familiar, since there is no branch of the profession which concerns them more intimately. In sailing-ship days organization was a comparatively simple matter. The ships were more or less uniform in type; sails and guns were all handled in the same manner. With the advent of steam there came a disquieting element in the form of an engineer's force. This was left to its own devices so far as organization was concerned so long as sufficient men were provided for the powder division, the machinery was ready for use, and the decks were not soiled. Since the handling and maintenance of engines, boilers, and auxiliaries are a thoroughly definite and concrete task, which permits of no experimental or theoretical organization, a working system was adopted which exists to this day, the only sound, military organization aboard ship. An officer is placed in charge of each of the three sub-divisions—engines, boilers, auxiliaries. He is responsible not only for the maintenance of the machinery in his sub-division, but for the cleanliness and preservation. The men under his command repair or clean as they are directed, and by him alone.

Outside the Engineer Department an entirely different system of organization has prevailed. The division officers have exercised direct control over their divisions only at quarters and drill. The cleaning of the ship was under the executive officer, who had for his assistants the boatswain, carpenter and master-at-arms. Since an executive officer's reputation has depended on the cleanliness of the ship, it was naturally foremost in his mind, the ability of the ship to shoot being a secondary consideration. The executive's duties under this system were naturally onerous, and to relieve the situation, a first lieutenant was introduced who was charged with the cleanliness of the ship outside the Engineer Department, while the executive officer was designated fire control officer and encouraged to take a more active interest in the gunnery of the ship. Whether the condition of affairs thus created was a success or not depended on the personality of the first lieutenant and the ord-

nance officer. It was a violation of the principles of sound military organization in that it placed the division officers under two superiors, each of whom was charged with radically different duties. The only sound method of placing the division officer in charge of both drill and cleanliness was not tried, although it already existed on board in the Engineer Department. The above organization exists to-day, but it is fair to state that boards have been appointed to consider the subject and recommend changes.

The waste of personnel in the above method is evident. This subject is thoroughly covered in the prize essay of the Naval Institute, 1909, "Some Ideas about Organization on Board Ship," by Lieutenant E. J. King, U. S. N.

TRAINING OF PERSONNEL.

History records few instances where battles were won by any but trained men. The ease with which the United States vessels defeated those of Spain in 1898, and Japan those of Russia in 1904-5, was due to a more highly trained personnel. Jervis paved the way for the victories of Nelson by training the personnel. The sea remains the same now as then, and it is probable that the victories of the future will be won by men who have become skilful through long practice in all the elements which unite in the make-up of a naval seaman—knowledge of the art of war, ability to handle great fleets, a thorough knowledge of the power and endurance of his instruments, and the confidence of those under his command.

The ability to handle ships and men can only come through practice at sea. At this time when half of the commissioned personnel have been out of the Naval Academy not more than six years, and when a great proportion of enlisted men are raw recruits on their first enlistment, the question of training is of special interest. Yet a proportion of the younger officers appear to be more interested in securing an appointment to a course of ordnance or engineering on shore, than in learning the primary duties of a naval officer.

The officer of the deck on a modern battleship is entrusted with a great responsibility which calls for unerring judgment and quick decision in time of emergency. These are primarily qualities that are trained by actual practice at sea. The ability to handle enlisted men is a necessary qualification of a naval officer. Mid-

shipmen upon graduation from the Naval Academy are notoriously but naturally deficient in this important subject. Some are by nature better qualified than others to acquire it quickly, but it requires a number of years of actual experience at sea to develop the necessary firmness, forbearance, and knowledge of the life, that are necessary in the officers if the ship is to be efficient, and at the same time happy. The actual experience can only be gained by the close association with enlisted men that results from division work. Yet it has been proposed to have all junior officers after a couple of years at sea spend a year or so in machine shops ashore in order to become practical machinists, and to be better fitted to handle the *genus homo* known as a navy yard workman.

The writer does not wish to be understood as advocating the actual spending of time at sea unless it is employed in useful work. The mere fact of actually being out of sight of land accomplishes nothing unless the time is devoted to some professional purpose. It is in the elimination of useless cruising that the field for improvement lies. The "sea habit" which is acquired by passing time at sea with no useful employment is of doubtful value. The annual coal bill of the navy is becoming so great, that it, alone, furnishes a strong argument for making every mile underway count for some useful purpose.

The truth of the matter is that we have gone material mad and have lost sight of the great fact that if the personnel is trained as it should be, it will demand material of the highest quality, and will get it. As an example of how skilled personnel will demand and obtain material of excellent quality, even under adverse conditions, may be mentioned the ordnance of the British navy. It was not until 1891 that the control of naval ordnance was entrusted to the Admiralty, being designed and supplied before that by the Ordnance Department of the army. To this day all British naval ordnance is built at Woolwich, or by private firms. Yet their ordnance has been in no way inferior to ours, and at one time could be considered superior. The general design of our ordnance was defective or antiquated until it was forced to a higher plane by a great increase of skill in gunnery. It was a case of personnel demanding and getting what it wanted in material. In the report of the chief of the Bureau of Navigation, Rear-Admiral J. G. Walker, U. S. N., of 1888, is found the following remark:

> The recent tendency of intellectual activity in the service has been rather towards subjects connected with the development of material. While ne

one should underrate the importance of high training for officers in this direction, it must be admitted that the material development would be useless without a corresponding training in the art of conducting naval war.

Clausewitz, in his work "On War," makes the following statement:

Formerly by the term "Art of War," or "Science of War," nothing was understood but the totality of those branches of knowledge and those appliances of skill occupied with material things. The pattern and preparation and mode of using arms, the construction of fortifications and entrenchments, the organism of an army and the mechanism of its movements, were the subject of these branches of knowledge and skill above referred to, and the end and aim of them all were the establishment of an armed force fit for use in war. All this concerned merely things belonging to the material world and a one-sided activity only, and it was, in fact, nothing but an activity advancing by gradations from the lower occupations to a finer kind of mechanical art. The relation of all this to war itself was very much the same as the relation of the art of the sword cutler to the art of using the sword. The employment in the moment of danger and in a state of constant reciprocal action of the particular energies of mind and spirit in the direction proposed to them was not even yet mooted.

These words were written nearly a century ago; yet even at that time the false conception existing in our naval service to-day, that the construction and preparation of material constitute preparation for war, had disappeared from Prussia.

PRESENT EMPLOYMENT OF TIME.

In considering the number of branches in which there is opportunity for improvement, the impression may be gained by one not familiar with actual conditions that the fleet is idling its time away. With regard to the energy expended nothing can be further from the truth. In fact there is some complaint about the fleet being overworked.

The following extracts from the Annual Report of the chief of the Bureau of Medicine and Surgery, 1912, are quoted:

A general physical deterioration of officers and men has been noted in the Atlantic Battle Fleet. Apparently there is no lack of muscular strength, nor has there been a percentage of sick beyond the average for other vessels or stations, yet their appearance conveys the impression of lowered vitality, their actions lack vigor and animation, and there is ever present an inertia which requires a great mental effort to overcome. During competitions nervous energy drives the flagging body to great activity, but immediately following there is a period of lassitude and the routine drills lack "snap" through an apparent indifference on the part of those engaged. Further, the brief periods of relaxation are spent in sleep below decks, instead of

healthful mental or physical exertion in the open air. In many cases, rather than undergo the effort necessary to take advantage of the opportunity of change resultant upon too short trips ashore, individuals prefer to lie around decks or sit in their rooms, doing nothing. Slouching carriage, shuffling gait, and a lack of smartness in uniform are commonly seen and even the officers do not possess the necessary energy to combat them. These conditions, associated with pallor, dull eyes, and lax, expressionless faces, occurring in a body of young men, all indicate a mental and physical weariness that should not exist.

DETERIORATION OF OFFICERS AND MEN ON BATTLESHIPS.

Relief from the high nervous tension produced by unremitting night and day drilling, month after month, by proper methods of relaxation, is urgently recommended as a necessary reform. The present system has the effect that overtraining has on an athletic team, and it is believed that not only the individual welfare of officers and men demands some modification of the present strenuous life afloat, but that military efficiency would be directly promoted thereby. Some reserve of nervous energy may well be safeguarded in time of peace, to be drawn upon, if necessary, in the emergencies of war.

The above represents the views of those directly charged with the physical welfare of the personnel. As a combatant officer, the writer believes that the whole amount of drill engaged in at present for any one year is not excessive and, in fact, should be increased. A summary of the elements of military preparedness in which the fleet is lacking at present, shows that it certainly is not "overtrained." The fault is believed to lie in the fact that the periods of drill and liberty are not properly proportioned, and drill periods are prolonged to a point where grounds for complaint of overwork may be more or less justified. To counteract this, a visit to a liberty port is made, drills are abandoned, the ship becomes demoralized, and another strenuous drill period is required to regain efficiency. It is either a feast or a famine. This condition of affairs will continue to exist until a more uniform intermingling of work and play is attained.

At none of the ports or anchorages frequented by the fleet are there adequate facilities in the form of athletic fields for officers or men, with the exception of Guantanamo. At Hampton Roads a field is obtained through the courtesy of the army. This lack of opportunity accounts in part for the lack of desire to indulge in athletic sports, but it may be that the officers in our service show less inclination to keep themselves in physical condition than those of other navies. A British service periodical, in commenting upon

the physical tests prescribed by official order, sarcastically stated that, "It is difficult to conceive of such an order being necessary in the British navy, as our officers have sufficient sporting instinct to maintain themselves in fit physical condition without compulsion."

Owing to the wandering proclivities of the fleet, and the location of navy yards in large cities where space is valuable, no athletic fields have ever been obtained for our service. How many times have we envied our British cousins in their possession of Happy Valley, or the spacious fields of Malta or Esquimalt!

The lack of interest now taken in much of the work of the fleet is probably due to a lack of knowledge of what the exercises are intended to develop and what conclusions have been drawn upon their completion. Also, where exercises are prolonged to such an extent that physical exhaustion results, lack of interest is bound to exist. This is best shown in the target practice exercises as held under present conditions in the Atlantic Fleet. Officers who were in the fleet during the visit to England in 1910 state that the British squadron based on Plymouth carried out target practice by getting under way in the morning and returning to the base in the afternoon upon the completion of the day's firing. Over night liberty was given and the practice resumed the following day under the same conditions. This represents one extreme, and the method followed by the Atlantic Fleet represents the other. It cannot be denied that there is usually a feeling of relief when target practice is over, a condition which should not exist.

In the work of the fleet there always seems to be the necessity of haste to finish one task in order to take up another. The schedule of work is prepared for but a few months in advance. Orders concerning it are hastily issued, and in some cases are followed by counter orders and disorder.

The Naval Academy, which stands well as an institution of learning, has a curriculum of studies and drills mapped out for the four years' course. The Atlantic Fleet, which is a university having a thousand officers and fifteen thousand enlisted men for students, and which represents a monetary value of $200,000,000.00 in material alone, has a curriculum which is prepared from month to month and subject to the varied ideas of every new commander-in-chief and his staff. It would be an exactly similar case if the present course of study at the Naval Academy was abolished,

and the superintendent directed to prepare, at his own discretion, such courses of study as he saw fit from month to month.

In looking back over the movements of the Atlantic Fleet for a number of years, it is found that there is one general routine that has been more or less followed—the ships are north in the summer and south in the winter. Bar Harbor, Rockport, Provincetown, Newport, and Hampton Roads have been used for operating ports in summer, and Pensacola, Culebra, and Guantanamo in winter. On one occasion the fleet made a cruise around the world, and on another, a cruise to European ports. The northern port chosen usually has been left to the commander-in-chief, the southern drill ground being settled upon for target practice, and Guantanamo for a winter base.

To show how the time of the fleet is actually spent, the following table is given, the time being for the year from October 1, 1910, to September 30, 1911.

Ship	1	2	3	4	5	6	7
Connecticut	80	34	5	171	43	32	149
Delaware	142	44	5	116	37	21	214
North Dakota	17	59	14	178	38	44	347
Michigan	69	74	5	144	41	32	466
New Hampshire	43	78	5	133	51	14	315
Louisiana	95	53	4	149	36	30	377
South Carolina	65	79	31	138	43	37	500
Nebraska	37	43	..	135	35	38	286
Georgia	38	61	11	172	43	36	212
Mississippi	80	70	5	136	40	35	385
Idaho	64	82	10	150	45	29	447
Virginia	89	54	12	137	33	41	227
Vermont	71	52	11	136	31	40	212
Kansas	82	68	8	142	31	31	357
Minnesota	85	39	1	171	39	33	307
Washington	83	45	12	170	37	33	312
North Carolina	78	39	39	186	46	39	451
Average	72	57	11	151	39	33	327

Col. 1.—Is the number of days or parts of days underway making passage on which no fleet drill or maneuvers were held.

Col. 2.—Number of days or parts of days underway on which drills or maneuvers were held, including torpedo and target practice and steaming trials.

Col. 3.—Number of days at anchor not available for overhauling machinery, excluding Saturdays and Sundays.

Col. 4.—Number of days at anchor or at a navy yard available for overhauling machinery, excluding Saturdays and Sundays.

Col. 5.—Number of Saturdays and Sundays at anchor on which overhauling of machinery was done.

Col. 6.—Number of Saturdays and Sundays at anchor on which overhauling of machinery was not done.

Col. 7.—Total number of hours underway actually engaged in fleet maneuvers, target practice, torpedo practice and steaming trials.

FOREIGN NAVIES.

It has not been practicable to determine what schedule of operations is followed in the British, French, and Japanese Navies. It is known that extensive maneuvers are carried on annually by the British and French. The following translation from the *Deutsches Offiziersblatt* of August 3, 1911, gives in a general way the program carried out in the German Navy.

THE ANNUAL PROGRAM OF THE MOVEMENTS OF THE HIGH SEA FLEET.

After the conclusion of the maneuvers, in the middle of September, the ships of the squadrons are taken to their home ports where they are given an overhauling at the Imperial yards. At the same time the usual changes in the personnel of the crews take place. Men who have served their time are discharged, those remaining will be required to participate in the work of repairs, the new recruits, who are distributed to their ships, receive their first instruction. Admirals, commanding officers, and officers also are subjected to transfers. This short period of transition offers the new hands an opportunity to adapt themselves to their new surroundings on board.

The new year of instruction proper for the fleet commences after leaving the yards. An extensive program is to be carried out; the main purpose being to place the fleet again in a condition of readiness. Right from the beginning the training of the individual goes hand in hand with the instruction of the units. Already in October the squadrons undertake from their respective stations practice trips conjointly, and in November the entire High Sea Fleet is assembled for the winter's cruise, which generally has the North Sea for its destination. Individual exercises of the units are carried on in the intervals of the joint maneuvers, and after return from the winter's cruise. These individual practices of the different units are very numerous, as the commanding officers will have to use this time to the best advantage in view of the fact that bad weather usually prevails in the winter.

The first inspections of the ships as to their progress of training for battle fall in the second part of December. Thus, after scarcely three months' instruction, each man is to demonstrate his ability to fill his place in action. It is also expected that up to this time a part of the instruction in gunnery and torpedo practice has been brought to a close.

All the exercises in gunnery and target practice of the First Squadron

stationed at Wilhelmshaven have this year for the first time all been carried out in the North Sea.

Whoever knows the North Sea in winter, realizes what difficulties are encountered in carrying on gunnery practice, and especially target practice in these waters. Up to this time it was held impossible to hold these exercises at the mouths of the Elbe and Jade. More favorable conditions were created with the improvement of the Helgoland harbor. The heavy target material, difficult to be towed, the large pontoon targets having the same draft as a battleship and towed by strong tugboats by means of a hawser 1000 meters long, can now find safe protection in bad weather in the port of Helgoland, as also the tugboats and steamers used for marking purposes. Of great importance is the saving of time, as compared with the former practice when the targets had to be towed out from the Jade. Notwithstanding this, however, target practice in the North Sea still has decidedly more disagreeable features than in the Baltic Sea, for the fact alone that ships are compelled to remain the greatest part of the practice season at the inhospitable roadstead of Helgoland. The praise, therefore, which the admiral of the First Squadron bestowed upon his ships for the well-executed gunnery and target practice in the North Sea, conducted without any casualties whatever, is surely well deserved.

The individual exercises of the ships last until April when the main inspection, connected with inspection in gunnery practice of all arms, takes place. The purpose of this inspection is to demonstrate that the training of the crews in all branches is finished, so that in the event of absence, or casualty of an officer, even of the commanding officer, and in case of technical casualties, the ship will be able to maintain its position in the fighting line.

The assembling of the squadrons for the spring cruise follows immediately after the conclusion of the main inspection. During this cruise attention will be principally paid to primary tactical evolutions.

The division of scout cruisers belonging to the High Sea Fleet will have made a cruise already in February for the purpose of tactical instruction.

In order to offer an opportunity to the school and experimental ships to participate in maneuvers, they will be assembled in April of every year to form a squadron to which are attached torpedo-boat and submarine flotillas.

In June all units of the High Sea Fleet are assembled in Kiel Harbor. During Kiel week—in the second half of June—the sporting contests: sailing and rowing contests, football and other sports are carried out. Frequently the crews of foreign men-of-war who happen to be in the harbor participate in these sports, for instance this year the American crews. This participation naturally heightens the interest. The fostering of sports in the navy doubtless furnishes the best means for the crew to keep up bodily exercise after removal of the rigging, confined as they are to a narrow space on board. The sports stimulate the crews to a spirit of emulation. Each crew likes to be in the lead.

After Kiel week, the High Sea Fleet starts on its summer cruise, after which the strategical maneuvers begin in September.

The officers of all branches of the army, detailed to the different ships about this time, are given an opportunity to study the administration of the

High Sea Fleet and through personal observation formulate their impressions as to the tasks of the navy in time of war.

During the summer cruise the exercises consist principally in the solution of tactical problems, tactical reconnoitering, battle problems, torpedo attacks, etc. In the summer of 1908 the High Sea Fleet went to the Canary Islands; in 1909 it visited the Spanish ports; in 1910 the Norwegian waters, which will also be the destination of this year's cruise. The longer the cruise the more severe will be the test to which the Supply Department of the fleet is subjected. The concluding maneuvers, always based upon a great strategical problem, and in which the reserve squadrons participate, are carried out in either the North Sea or the Baltic. They last about 8 to 10 days. The most interesting feature of these maneuvers is probably the strategical reconnoitering exercises on a large scale; very exciting also are the attacks against the fortified ports, for in observing these attacks an idea can be formed of the blockade wars of the future.

EMPLOYMENT OF TIME.

Since the fleet is now said to be overworked and so many serious shortcomings exist, how is it possible to improve conditions?

A noted engineer in civil life discovered that by eliminating unnecessary movements, it was possible for an ordinary bricklayer to double his capacity.

Perhaps the foregoing fact may suggest a remedy. We developed a method of eliminating useless time from gun loading and firing several years ago. Cannot the same method be extended on a grander scale to the work of the fleet?

The only reason for which the battleship fleet exists is to succeed in battle. Hence all its training should be with that end in view. By bearing this in mind it may be found that the time spent in some of the drills can be spent to better purpose in others, and that the whole subject of the movements of the fleet may be subject to improvement with reference to results accomplished for energy expended. In a scrutiny of the table, analyzing the work of the fleet, one is impressed with the large number of days underway on which no drills or maneuvers were held. Is it not possible to decrease column 1 and increase column 2?

In working out any schedule of operations there are several elements which enter into the proficiency of a fleet and which must be taken into consideration. The most important of these are:

(a) The drills and maneuvers in which the crews, ships and fleet should be exercised.

(b) The upkeep of the material.

(c) Contentment of personnel.

(d) Political considerations.

DRILLS AND EXERCISES.

In any conception of the conditions that will exist at the outbreak of war, the one that may be assumed to develop the dispositions and maneuvers in which it is necessary for the fleet to be proficient is the one where the enemy is known to be underway with the view of attacking our coast, or seizing a base within or without the country. This calls for an attempt on our part to discover his whereabouts at the earliest possible moment, or scouting on an extended scale. Having once found the enemy, and assuming ability to remain in touch, the commander-in-chief must move his main fleet in such a manner as to attack under the most favorable conditions. Defense against torpedo attack becomes necessary as the fleets approach, and a favorable battle formation must be assumed before contact takes place. After the contact, gun fire comes into play, and all the maneuvers that will take place between two great fleets, whatever they may be, with additional factors of torpedoes and floating mines. Speed may, or may not, be an important consideration. But reliability of machinery will be most decidedly so. In this rough and incomplete sketch, gunnery is the only factor in which consistent and systematic endeavor is being made toward proficiency. Considerable progress has been made toward increasing the reliability and efficiency of the motive machinery but a great handicap still exists in the uncertainty of time for upkeep and overhaul. This will be considered later.

The principal exercises in which training is required may then be enumerated:

(a) Maneuvers on a large scale involving dispositions of main fleet and scouts.

(b) Torpedo defense.

(c) Battle formations.

(d) Gun fire.

(e) Exercises with torpedoes and mines.

While few in number, the above exercises afford a large field for work and study. Proficiency in them may be considered absolutely necessary for success in battle.

In addition to the above are the secondary drills, intended for individual ship efficiency, and training of the personnel. The latter can always be carried out at such times as not to interfere with the former.

UPKEEP OF MATERIAL.

In any schedule, the upkeep of machinery must receive the greatest consideration. The guns will be of no use on the day of battle unless the machinery is in condition to bring them there. The comparative value of the *Oregon* and the *Indiana* at the battle of Santiago is still fresh in our minds. Had that war been with a naval power of equal strength, this reduction in value of a first-class battleship, due to inefficient machinery, might have spelled disaster. The general deterioration of the armored cruisers on the Pacific station a few years ago, due to lack of time for upkeep resulted in General Order No. 49, showing that the Navy Department was awakened to the situation. Some improvement followed, but of no great amount. In any temporary, hastily proposed schedule the Engineer Department is the one that suffers most heavily. The value of the time at anchor for overhaul can be doubled or trebled by announcing beforehand how long and when the time is to be. Work can be planned, arrangements made in advance, and material collected. Apart from the low speed at which the vessels cruised, one of the main reasons for the creditable machinery performance of the battleships on the cruise around the world, was the fact that the dates and length of time at anchor were known months in advance.

In order to investigate a statement that the overhauling of machinery on the Atlantic liners was done by shore mechanics at each end of the run, the writer recently visited several large vessels belonging to the larger companies. Instead of a number of skilled mechanics going on board as soon as the lines were made fast, and placing everything in excellent condition, as naval tradition has it, it was found that a few laborers were hired to help clean the fire sides of boilers—not more than a dozen on some of the larger vessels. The ship's own force overhauls all machinery, taking valves, cylinders, bearings, and water sides of boilers in rotation, and doing as much as possible at the end of each run. The time that the vessel is to be in port is known exactly for a year in advance, and the work can be blocked out accordingly. The number of men in the engineer's force of these vessels is of course considerably less than on naval vessels. The *George Washington,* of 20,000 horsepower, has an engineer's force of one hundred and seventy men, and the *Lusitania,* of 70,000 horsepower, has three hundred men. *Yet after five years' service*

without a break in the running schedule, the latter vessel has just had her first overhaul period of two months.

In time of peace our battleship fleet has no more important duty than to prepare for war, and bearing in mind that there is no more important consideration than the maintenance of the motive machinery in efficient condition, we may well take some leaves from the merchant engineer's note book, and adopt a schedule that will permit of thorough upkeep. *A week at anchor for every week underway is a fair basis to adopt, and it is none too much.* A period of less than seven days is not of much value for the overhaul of boilers, condensers, and other items where considerable time is spent in dis-assembling and assembling. To develop the defects of machinery, it is necessary to use it under severe conditions, but if this is done, it is also absolutely necessary to allow regular and frequent periods of overhaul.

A subject closely connected with upkeep of material is that of navy yards. These are at best a necessary evil—necessary because of " repairs and alterations beyond the capacity of the ship's force," but an evil, not only because the vessel ceases to be a military unit while at the yard, but because of the demoralization of personnel that results from the presence on board for long periods of time of a horde of navy yard workmen. It takes an appreciable length of time after leaving a yard for a ship to recover from the effects of the visit. So if any means can be devised by which the number of repairs to be done at a yard can be reduced and these repairs done on board, or with the assistance of the repair ship, it will redound to the efficiency of the fleet. It may be remarked that under the present system when the navy yard is the " home port " and the " overhaul period " is the only definite period known in advance relative to the whereabouts of the ship, there is a disinclination on the part of the personnel of the ship to reduce the length of the period. It is but natural under present conditions. If a working port is selected for the fleet, the present tendency to favor the navy yard will disappear.

The following considerations should govern the work done on vessels of the fleet at navy yards, and the time of their visit:

(a) Extensive alterations never to be done on vessels of the active fleet.

(b) A vessel to be sent to a navy yard at once upon the development of any defect that will interfere with her efficiency in time of

war. This will include major defects developed in service such as defective guns, boilers, engine parts, etc.

(c) No vessel to go to a navy yard except when designated by the commander-in-chief.

It is realized that such a procedure will interfere with the uniformity of the number of workmen employed in navy yards, but the efficiency of the fleet is believed to come before that of repair yards. Give the vessels of the active fleet a rational schedule that will permit of upkeep and a good repair ship with an opportunity to use it, and the necessity for navy yards, as far as the fleet is concerned, will largely disappear, except for emergency jobs, and docking purposes.

The fleet abstained from navy yards for fifteen months during the cruise around the world and the machinery was reported in more efficient condition at the end of the cruise than at the beginning. The most efficient battleships we have had in both personnel and material were the *Oregon* and the *Wisconsin*, when on the Asiatic station several years ago, where no navy yard existed.

Train the personnel in the way it should go and the material will follow.

Chief Engineer McAndrews, of Kipling fame, realized this when he said:

"We're creepin' on wi' each new rig—less weight and larger power.
There'll be the loco-boiler next, an' thirty knots an hour.
Thirty an' more. What I ha' seen since ocean steam began
Leaves me no doot for the machine, but what about the man?"

CONTENTMENT OF PERSONNEL.

The contentment of personnel is so closely connected with its efficiency that the former word is more comprehensive than appears at first glance. Call it *morale, esprit de corps,* or any other name, it means efficiency in the end, for a personnel cannot be efficient unless it is contented. To be contented, there must be interest in the work; the purpose for which the fabric exists must be understood by all. Work well done must be recognized with praise, and work badly done with just but thorough condemnation. And in addition to all must be given the opportunity to enjoy as many of the natural phases of human existence as the service will permit. Life on board ship is an unnatural one at best.

Seagoing has improved since Dr. Johnson made the statement that he preferred a jail to ship life, since the company was no worse and he was considerably safer, but there still remain certain unavoidable discomforts which are inherent to the life and which cannot be eliminated. On the other hand it has a certain charm in the possibility of adventure and the fascination of strange lands that has been the theme of writers since the beginning of fiction. This phase has long been appreciated and employed in recruiting.

So in the employment of the fleet there are two classes of enlisted personnel to consider:

(a) The men who have decided to make service in the navy their lifetime vocation. This class is the backbone of the enlisted personnel and comprises the bulk of the petty officers. Many of them have married and contracted home ties. Decidedly the schedule of employment should be such as to permit these men to spend a fair proportion of time with their families. There is little prospect of shore duty for such men except in a few isolated cases which bear a small percentage of the total number in the service. It is usually impracticable for an enlisted man's family to " follow the ship," so that the only time that can be counted on is the annual leave. The prospect of fifteen or even thirty days at home out of every year is not sufficiently alluring to hold many men in the service when they realize that the disposition of the remaining time may be such as to preclude any opportunity of time at home.

Of the men of this class who return to civil life, a large proportion are of such character as to make their retention in the service most desirable. A man who has sufficient courage, and confidence in his abilities to make a success of life outside is usually the type of which it is desirable that the corps of petty officers consist. Here is a great field for the accomplishment of two objects, with no increase of cost, energy, or time. Can we retain such men in the service, receive the value of their training, and insure them a fair proportion of time spent in the enjoyment of home ties? It can be done, and done only by the adoption of a permanent home or working port. Not the present " home port " as afforded by a navy yard, which changes every time the ship is shifted from one division to another, and where, for the good of the navy, as little time should be spent as possible, but a port on which the fleet is

based for the carrying out of exercises during a large part of the year.

(b) The other class of men to be considered in a schedule of employment is that composed of men in their first enlistment, generally young in age, who have been attracted by the romance of the sea, the possibility of seeing foreign lands, and other inducements held forth by the recruiting officer. It is probable that for a number of years the navy will have to depend on this class for the rank and file. They are usually bright, able youngsters, who make fair sailormen after a couple of years' training, and who drift back into civil life at the end of the enlistment, their impressions of the service being based generally upon the extent to which naval life measured up to their original expectations upon enlistment. It is only fair to these men that a schedule be adopted which will fulfill as nearly as practicable the promise on the part of the government of "opportunities to see foreign lands." The impressions of a happy shore leave in a Mediterranean port do much to wipe out the unpleasant recollections of less congenial experiences. Such a man in civil life, whose reminiscences of his naval service deal with strange ports whose names all his audience have heard, and few seen, becomes a potential recruiting officer.

A cruise to our own ports and those of the West Indies and Europe every four years is easily possible and should be provided for in whatever schedule is adopted.

At the present time is the personnel of the fleet contented or otherwise?

As an indirect answer to this question reference may be made to the large number of desertions, and small proportion of continuous service men in the enlisted force, and the strong desire on the part of officers for shore duty at the end of a three years' cruise or before if possible.

In the decade ending with 1911, thirty-five thousand men deserted from the naval service, and in 1910 the retired list numbered but three hundred.

This condition of affairs is assuredly unhealthy. The practice of his profession at sea is the primary duty of a naval officer, and the one for which he has been trained at considerable expense by the government. If the performance of this duty is considered an irksome task which must be endured in order to retain a position in the naval service, it indicates a symptom which should be in-

vestigated most carefully. Due allowance must be made for the "sailor's growl," but it will be found that where general growling exists, there is usually a sufficient cause.

POLITICAL CONSIDERATIONS.

From the past history of the fleet it will be found that its movements in certain cases are dictated by political reasons which may be classified as follows:

(a) Visits to ports on 4th of July.

(b) Naval reviews.

(c) Visits to certain ports at odd times at the requests of senators, chambers of commerce, etc.

(d) Visits to Caribbean ports due to uncertain political conditions.

Of the above visits (a), (b), and (c) serve to advertise the navy and afford an opportunity to many people to visit the fleet. They cannot be eliminated, nor is it desirable to do so, and (a) and (b) are easily provided for in any schedule. The only drawback to them under present conditions is that they are decided upon very shortly beforehand and break up some proposed plan of operations, with resulting confusion. (c) and (d) are more difficult to provide for, and in such cases, to prevent a disarrangement of the schedule, it would be necessary to use reserve ships. There are few conditions that may arise in the Caribbean which require sending battleships of the active fleet there, a transport loaded with marines being more to the point. During the recent insurrection in Cuba the Havana newspapers extracted considerable amusement from the question how the battleships would succeed in chasing the insurgent general over the mountains of Oriente. But when their services are really needed, the disruption of a fixed schedule becomes unavoidable.

In the Report of the Bureau of Navigation for 1900 is found the following plaintive statement:

> The vessels of the North Atlantic station have, as heretofore, been engaged with a program of drill and instruction for the vessel organization as units and for the officers and men individually. It is much to be regretted that the drills planned for this squadron are compelled to be often interrupted by attendance of the vessels at local celebrations. These interferences invariably tend to demoralize the efficiency of the personnel.

NECESSITY OF A HOME PORT.

When the problem is studied of increasing the output of the fleet in battle efficiency without increasing the effort involved, which is already excessive, no solution can be reached which does not require the adoption of a home or working port for the fleet for the greater part of the year. To increase the number of days underway carrying out maneuvers, the time lost in making passages from one port to another must be eliminated. Every time the fleet gets underway it should be for some definite purpose, the reason for which has been threshed out beforehand and the information diffused. The coal thus burned and the energy expended will be to a useful end.

For the upkeep of machinery, the time not spent underway in fleet work should be at anchor in the home port with the repair ship, the exact time at anchor known long in advance. Only in this manner can work be planned, material collected, and the facilities of the repair ship utilized. The latter is an expensive luxury unless her repair plant is kept busy. The cost of maintenance of the *Panther* is $180,000 a year, and if this is added to the work she has done, as an overhead charge, the cost will be found rather high. A repair ship, however, is a military necessity, and the expense of maintenance cannot be avoided.

To give the officers and crew the usual amount of leave and liberty, and to give it under conditions most advantageous to themselves and the ship, requires a definite schedule and a home port. Leave for the engineer's force can best be given when the ship is underway, thus rendering their services available when at anchor, and when they are most needed. By giving to commanding officers the authority to grant leave, subject to general regulations, a mass of useless detail will be lifted from the flag-ship. And by a known schedule and known locality, the captain is able to plan the leave for months ahead. If a man of the rank of captain is considered competent to command 900 men and a vessel valued at $10,000,000 to $16,000,000, surely he can be considered competent to decide whether or not a member of his crew can be given a few days' leave.

SELECTION OF A HOME PORT.

Whatever port is selected for a home port or base must possess certain characteristics.

(a) It must provide sufficient anchorage room for the fleet.

(b) It must be near the open sea.

(c) It must be so located as to furnish a good liberty port for the crew.

On the whole Atlantic Coast there is but one port which possesses these three characteristics, and that is Narragansett Bay. The coast of Maine is too foggy, and possesses no good liberty ports. Provincetown is no liberty port. New York is too far from the sea, and is crowded with shipping. Hampton Roads is hot and unhealthy in the summer, and is no liberty port.

No other port offers equal facilities for liberty men to scatter to nearby large cities. Fall River is one hour away, Boston and Providence two hours, and New York six hours. None of the large cities of Connecticut or Massachusetts are more than six hours distant.

In addition to the necessary natural characteristics of great anchorage room, and nearness to the sea, there is a coaling station, torpedo station, training station, and War College already located there. In any well regulated scheme of affairs, the War College will be indispensable to the fleet.

BLOCKING OUT A SCHEDULE.

It has already been shown that in working out a schedule the following elements should be considered:

Drills and exercises of the fleet,
Co-ordination with the War College,
Upkeep of material,
Leave and liberty,
Visits to United States ports,
Visits to foreign ports,
Naval reviews, and
Necessity of a home port.

The general strategic and tactical exercises of the fleet can be worked out only by taking the results of what has already been accomplished, so far as they can be determined, as a basis; then, with the aid of the best talent available, map out the plan of exercises to be followed. This cannot be done specifically, as future exercises may depend upon the results reached in those that have been completed. It is in the working out of these exercises that there must be co-ordination between the fleet and the War College.

The task of analyzing the results of exercises would seem to be one that properly belongs to the War College. No strategic or tactical exercise should be undertaken without some definite object in view, and the different exercises should be numbered, discussed, analyzed, and conclusions drawn as carefully as in an experiment in a chemical laboratory. All exercises that are to be held should be explained and discussed in conference by the officers of the fleet before the actual performance is undertaken, and should be similarly discussed upon its completion. Knowledge of what is to be undertaken and what results are obtained is the right of every officer in the fleet, and it is a vast waste of time, money, and opportunity to withhold such information from them.

This waste of opportunity is commented upon by Frederick the Great in his writings as follows:

> To what does life serve if it be the life of a plant; what use is it to see things only to have seen them? Vegetzie says war should be made a study, should be regarded as an uninterrupted exercise, and he is right.
>
> Experiments should be conducted carefully. Artists arrive at the conception of the fundamental principles only after careful analysis, and in moments of rest prepare new material for experiment. Such investigation constitutes the power of inquiring minds. But how rarely are such persons met; while on the other hand, how frequently do we meet those people who, possessing the use of their senses, never think of employing their minds. Reflection alone, or, to express ourselves more accurately, the power of placing our conceptions in order (to think logically) distinguishes man from the animal. The mule who had made ten campaigns with Prince Eugene was none the better tactician for it, and to the shame of man it must be admitted, in consequence of this idle stupidity, many old (*i. e.*, experienced) officers are not a bit better than the above-mentioned animal.
>
> Such people move when all others move, following the routine requirements of service, absorbed in the performance of their personal duties and looking for something good to eat; they move when others do; they pitch their camp when others pitch theirs; they fight when others do, and this, in the minds of many, constitutes campaigning and participation in war. Here is the source, the true reason, of existence of those masses of persons absorbed in trifles who remain in gross ignorance of military principles, and who, instead of elevating their minds to the heavens, wallow in the dust of routine and never bother themselves to discover the reasons for their successes or failures, although such knowledge would be of the greatest value to them.

By this method a rational, progressive system of work will be established which will continue independently of changes of command; the results of the work will not be lost, as at present, and as in the past, and officers ashore or on other stations can keep in

touch with the progress of the fleet. This is done at present in gunnery and engineering.

The chart accompanying this article shows a proposed schedule drawn up in such a manner as to reduce useless cruising to a minimum, and to allow for the different elements which must be considered.

Narragansett Bay has been adopted as the base of operations.

The beginning of the calendar year is taken as the beginning of the schedule. While it may be desirable to begin the schedule in May or June on account of the large number of changes in officers at that time, it is deemed better to begin the schedule at the beginning of the year in order that the foreign cruises and time at Guantanamo may be considered as divisional cruising periods, and this period offers the best opportunity for preliminary training. The transfer of officers of the fleet among battleships, destroyers, and gunboats can be done at the naval review, or at the base, at the end of the year. The officers on duty at the Naval Academy, who are detached at the end of the academic year will be the only ones of any number who join the fleet after the serious work begins. No attempt is made to carry out fleet work at Guantanamo. With few exceptions, the work done by the combined fleet under present conditions at Guantanamo consists of work which can be well done by an individual ship. It is an abnormal waste of opportunity to assemble an entire fleet and then engage in swimming or small-arm practice. The value of these accomplishments, while recognized as worthy of some notice, is infinitesimal in comparison with other exercises which receive no more attention.

The schedule provides for a European cruise, and a West Indian and Gulf cruise on alternate years. In planning European and West Indian cruises, it should be arranged, so far as practicable, that *not more than one ship will be in a port at one time.* The official character which a visit with a number of ships assumes renders it a burden to both host and guest. Allowing two months for the European cruise, and going no farther east than Italy, will require about 9000 miles steaming upon the return to the United States. At twelve knots this requires thirty days underway, leaving thirty days in port, or a week in each of four ports. Horta, Funchal, Lisbon, Algiers, Naples, Villefranche, Barcelona, and Gibraltar offer a chance for a Mediterranean cruise. This cruise

is taken by the division which leaves directly for Europe the first part of January. The division leaving from Guantanamo for Europe in February can visit English, French, and German ports.

For the divisions visiting Gulf and West Indian ports there is offered the following: Charleston, Pensacola, New Orleans, Galveston, Kingston, Havana, St. Thomas, St. Kitts, Barbados, Trinidad, La Guayra and Colon.

The time underway can be spent in ship drills, especially gun drill and sub-caliber practice, as a preparation for the target practice in April.

The time at Guantanamo is spent in torpedo practice, small-arm practice, etc., the ships being given a free hand to carry out such drills as are most needed to develop individual ship efficiency. For torpedo practice the deep, smooth water off Guantanamo offers an excellent locality. Fewer torpedoes will be lost there than in shallow water.

Upon the return from divisional cruising, vessels proceed to the several yards for docking, two weeks being allowed for this purpose. Leave can be given to the deck force during this period, but not to the engineer's force, whose services will be needed on board. Leave for the latter can begin after the docking period. It has been found not only practicable but most desirable to give leave to the engineer's force at periods when the ship is underway.

After docking, the fleet proceeds to the base, the first week underway being devoted to a final preparation for target practice, which takes place in the second week underway.

After this time the weeks at anchor and underway alternate for five months, the only break in fleet drill being 4th of July week, when the vessels scatter to the various ports to be visited. At the end of this week the Naval Militia of the several districts is taken on board for the coming week's work. At the end of this week they are returned and the vessels assemble at the base.

The autumn target practice takes place in September, followed by the naval review, docking period, and steaming trials. Three weeks of fleet drill take place in November and December under more strenuous conditions of wind and weather than obtain under present conditions.

The latter part of December is spent at the base, Christmas leave being given.

From an inspection of this chart it is seen that there is a prac-

tically unbroken period of eight months for fleet drill. Assuming that vessels are underway from Monday to Friday, there will be seventy-five days underway, spent in drill or target practice. Thus in eight months there will have been about twenty days more time spent underway for drill than was averaged by the fleet for a whole year under present conditions. The gain comes from the elimination of useless cruising. Within an hour after leaving port the fleet is upon the drill grounds in deep water and unlimited space.

If we assume that eight of the twenty-four hours of each day underway will be spent in drill it results in six hundred hours instead of three hundred and twenty-three hours or twice the amount. As a matter of fact it will probably be trebled, as the eight hours a day will be exceeded, due to grand maneuvers and night torpedo defense work, and due to the fact that none of the work on divisional cruises is included in the six hundred hours.

The proposed schedule is not as arduous as that under which the fleet works at present, and the time devoted to drill is more than doubled. By drill is meant actual work, and not "drill" according to the pictures in the Tactical Signal Book. It is firmly believed that the time spent in the latter form of "drill" is absolute waste since what is gained in questions of position keeping and turning will be gained in other drills under more realistic conditions. With the different types of vessels which will always compose the fleet it is not practicable with any amount of drill, nor is it necessary to obtain precision in evolutions.

Under this schedule during a four-year enlistment, a man will have visited eight European ports, eight West Indian ports, and all the principal eastern ports of the United States.

An officer or man with home ties is assured of nine months of the year in the neighborhood of his family. By knowing a year in advance the exact movements of the fleet, personal arrangements can be made of considerable pecuniary advantage.

The advantage that is gained in the upkeep of machinery cannot be estimated. But it is safe to say that such a schedule will be hailed by engineer officers with great joy, as it gives them ample time for overhaul, at frequent periods, known long in advance—the three great requisites for upkeep.

Every officer and man can know months in advance when he can go on leave and a present source of discontent, especially in the engineer's force, will be removed.

The amount of tropical cruising is reduced to a minimum, as will be noted from an inspection of the schedule. The longest time in the tropics is three months in one year, and that applies to but one-half the fleet. Any protracted cruising in the tropics, or in the southern ports of the United States, including Hampton Roads, in the summer months, should be avoided. Why schedules have been made out in the past involving such cruising passes understanding. Hot weather bears especially hard on the engineer's force, and, if continued, cannot result in other than deterioration of the personnel. There is no such thing as hardening men to endure unhealthy conditions. There is a great difference between tropical life under an awning on deck and in engine, fire, and evaporating rooms. As an example, on one ship in the fleet the temperature in the evaporating room is 140° when the temperature on deck is 80°. The temperature of a man stationed in this room rose from 98.4° to 100°, and his pulse from 80 beats to 146 beats in an hour and a half. This represents an extreme case, but in many of the ships the temperatures are between 100° and 140°.

The following is an extract from an essay entitled "A Sanitary Study of Culebra as a Naval Base," by Medical Director Howard E. Ames, U. S. N.:

> In the tropics the respirations are lessened, and the breathing is gentler. The tidal air being less, the amount of oxygen is diminished. When the temperature is high, the heart movements are slower, the skin acts more vigorously, the urine is reduced in quantity, the amount of urea is diminished, there is less vigor of mind and body; less weight is also observed. No doubt, humidity in combination with heat has a great influence in all these effects. The digestion is not strong. All of these observations show that they are the natural adaptability of the system to adjust the functions of the body in keeping with the climate. When once established they are, for that place, normal; no doubt degraded so far as vigor is concerned, but this does not mean functional degradation or disease. These changes teach us that exertion of all kinds, both physical and mental, must be diminished; that the same amount of activity cannot be demanded that is obtained in the temperate zone.

The strength of nations has been asserted by a certain authority to be a question of latitude, and the statement applies with equal force to navies.

In the tentative schedule which has been proposed any port may be adopted for a working base instead of the one which has been proposed. The amount of time that will be gained by the elimination of useless cruising remains the same. Whatever port

is adopted, however, should combine to as great an extent as possible the necessary characteristics of a working base.

The proposed schedule does not interfere with the present schedule of overhaul and docking periods adopted for the fleet, and will not prevent any modifications that may be found necessary in the future.

The reduction of administrative work by the adoption of a schedule similar to the one proposed will be very great. The questions of fuel supply and provisions can be worked out long in advance. More results can be obtained from colliers and supply vessels when their future movements are known with a reasonable degree of certainty.

Target practice and steaming trials have been placed in the schedule at times corresponding with the present custom. As a matter of fact they are both "fleet drill," and can be placed in the schedule at such times and as often as may be found desirable. The only necessary requisite is that the times and methods be known as long in advance as possible—preferably a year.

Last but not least, the fleet athletic officer will have a basis upon which to erect a schedule of his own. The arrangements for the carrying out of the numerous athletic events of the fleet will be greatly simplified.

SHIP ROUTINE.

It has been shown in the preceding pages how the number of hours devoted to drill can be doubled by working from a base and by proper distribution of time, the periods underway and at anchor properly alternating. It is believed that the present daily routine followed by the battleships of the fleet can be modified so as to produce more results in efficiency of crew and upkeep of material than can be obtained under present conditions.

The following extracts are given from the daily routines of the Atlantic Torpedo Flotilla and the battleship fleet:

TORPEDO FLOTILLA.

6.00 a. m. All hands.
8.15 a. m. Turn to. Muster and Inspection. Routine drill.
11.30 a. m. Knock off work.
1.00 p. m. Turn to.
4.30 p. m. Knock off work.

BATTLESHIP FLEET.

5.00 a. m. All hands (weekdays). (Note.—5.30 when sun rises later than 6.30.)
6.15 a. m. Turn to.
9.15 a. m. Quarters for muster, inspection, and setting up. Drill call.
11.15 a. m. Retreat from drill.
1.00 p. m. Turn to.
4.00 p. m. Knock off work.

It will be noted from the above that a period of two hours and fifteen minutes elapses in a destroyer from reveille until drill begins, while in a battleship it takes four hours and fifteen minutes to arrive at the really important work of the day. A destroyer is a man-of-war fully as much as a battleship, and in proportion to crews has just as much, if not more, work to do in drills and ship upkeep.

An inefficient destroyer is comparatively rare, and although the duty is more arduous for personnel than that on large ships, service in the flotilla is popular with both officers and men.

If the personnel of the flotilla is efficient and contented, a condition exists which is worthy of investigation.

The efficiency and popularity of the torpedo flotilla are believed to be due to a thorough appreciation by the personnel of the military reason for its existence and the elimination of lost motion and useless effort in the work for efficiency, coupled with a closer personal contact between officers and men for bringing about this result.

If reveille can be at 6.00 a. m. and drill call at 8.15 on a destroyer, why cannot it be the same on a battleship? If a man musters for drill in working clothes on a destroyer, which is a very sensible thing to do, why cannot it be done on a battleship?

The destroyer routine provides for one hour and forty-five minutes more time at drill and ship work than the battleship routine—a very appreciable increase. Yet destroyer crews sleep in until 6.00 a. m., a privilege which is granted to battleship crews on Sundays and holidays only.

As an improvement on the present battleship schedule, the following is offered:

PROPOSED DAILY ROUTINE.

6.00 a. m. All hands.
6.20 a. m. Turn to; clean decks.
7.00 a. m. Up all hammocks.

7.30 a. m. Breakfast.
8.30 a. m. Turn to; muster; drill.
11.30 a. m. Retreat.
12.00 a. m. Dinner.
1.00 p. m. Turn to; ship work.
4.00 p. m. Knock off work. All hands wash up and shift into clean clothes by 4.30.
4.30 p. m. Liberty party. Scrub clothes.
6.00 p. m. Supper.
8.00 p. m. Hammocks.
10.00 p. m. Taps.

The advantages claimed for the proposed routine are:

(a) Increased time for drill.

(b) Concentration of drill periods, and ship work periods. All drills are in the forenoon; all ship work in the afternoon.

(c) Elimination of the "spit and polish" period from 8.15 to 9.30 a. m. A ship with a large amount of bright work usually has the stow holes and dark corners full of filthy cleaning gear.

(d) A more rational hour for reveille.

By scrubbing clothes in the evening instead of during the morning watch, this becomes practicable. One hour for washing down decks should be ample.

Instead of the times when certain drills are to be held being specified in the fleet regulations, it is considered more desirable to enumerate the drills in which ships are expected to be proficient and to leave to the commanding officer the details of when and how often these drills are to be held.

A complete discussion of the subject of an interior ship routine which will develop the greatest efficiency with the least necessary expenditure of energy is beyond the scope of this article. Questions of employment of time, liberty, and punishments, furnish material for extended study.

It is realized that a spirit of criticism pervades this paper, but it is held to be criticism in the best sense of the word in that it is offered with a view of pointing out defects that are believed to exist in the present organization, and advancing what are believed to be feasible methods of improvement. The readiness of the fleet for war is a subject that should be nearest the heart of every naval officer.

In considering any method for the improvement of the service, optimism should not be allowed to convince us that conditions are

thoroughly good, or pessimism that they are utterly bad. Only by a calm, thorough analysis of conditions as they actually exist, with a frank recognition of faults and shortcomings, and an earnest endeavor on the part of all to reach a higher plane of preparedness, can progress be made.

In his introduction to Clausewitz' "On War," Colonel Maude of the British Army, says:

> The ultimate consequences of defeat no man can foretell. The only way to avert them is to ensure victory; and, again following out the principles of Clausewitz, victory can only be ensured by the creation in peace of an organization which will bring every available man, horse, and gun, or ship and gun if the war be on the sea, in the shortest possible time, and with the utmost possible momentum, upon the decisive field of action which in turn leads to the final doctrine formulated by Von der Goltz in excuse for the action of the late President Kruger in 1899:
>
> *"The statesman who, knowing his instrument to be ready, and seeing war inevitable, hesitates to strike first is guilty of a crime against his country."*

These are strong words, but true, for in the eternal war of "the survival of the fittest," there is no mercy or chivalry, but sudden and deadly blows.

The Franco-Prussian War, the Spanish-American War, and the Russo-Japanese War furnish three appalling examples of the crushing defeat that awaits the nation unprepared. Whether the possibility of war is remote or otherwise has no place in the thoughts of naval officers; but pre-eminent should be the endeavor to bring the greatest strength and skill to the arm that will wield the weapon already forged.

This article simply attempts to point out a method by which the work that is demanded of the fleet in an ever increasing scale as time goes on, may be accomplished with less effort, or more work with the same effort, than can obtain under the routine that has been followed for so many years. All honor to the officers and men, from admirals down, who have striven in the past to develop the great machine. It has been hard, gruelling work, and none but those in the service can appreciate what it has cost in stress of mind and body to develop our Atlantic Fleet as it exists to-day.

But competition is keen and unrelenting, and the struggle must continue. If the ideas advanced herein can in any way further progress, they will not have been in vain.

PROPOSED SCHEDULE OF EMPLOYMENT—U. S. ATLANTIC FLEET—BASE IN NARRAGANSETT BAY.

Week.		First Division.	Second Division.	Third Division.	Fourth Division.	Remarks.
Jan. 5–11	1	Guantanamo.			Guantanamo.	
12–18	2	Divisional work.	Cruise to gulf ports.		Divisional work.	
19–25	3	Small-arm firing.			Small-arm firing.	
26–1	4	Torpedo practice		European cruise.	Torpedo practice	
Feb. 2–8	5		Guantanamo.			Divisional b ball, boxi and track letics.
9–15	6		Divisional work.		Cruise to West Indian ports.	
16–22	7		Small-arm firing.			
23–1	8		Torpedo practice			
Mar. 2–8	9	European cruise.		Guantanamo.		
9–15	10		Cruise to West Indian ports.	Divisional work.	Cruise to Gulf ports.	
16–22	11			Small-arm firing.		
23–29	12			Torpedo practice		
30–5	13	Docking period.	Docking period.	Docking period.	Docking period.	
April 6–12	14	New York.	Norfolk.	Boston.	Philadelphia.	
13–19	15	Base.	Base.	Base.	Base.	Prepare for t practice. B races.
20–26	16	Target practice.	Target practice.	Target practice.	Target practice.	
27–3	17	Base.	Base.	Base.	Base.	Division and base ball ga
May 4–10	18	Fleet drill.	Fleet drill.	Fleet drill.	Fleet drill.	
11–17	19	Base.	Base.	Base.	New York.	
18–24	20	Fleet drill.	Fleet drill.	Fleet drill.	Fleet drill.	
25–31	21	Base.	Base.	New York.	Base.	
June 1–7	22	Fleet drill.	Fleet drill.	Fleet drill.	Fleet drill.	
8–14	23	Base.	New York.	Base.	Base.	
15–21	24	Fleet drill.	Fleet drill.	Fleet drill.	Fleet drill.	
22–28	25	New York.	Base.	Base.	Base.	
29–5	26	Individual ship cruise.	Individual ship cruise.	Individual ship cruise.	Individual ship cruise.	Vessels to arri designated ports on July
July 6–12	27	Fleet drill.	Fleet drill.	Fleet drill.	Fleet drill.	Naval milit board.
13–19	28	Base.	Base.	Base.	Boston.	
20–26	29	Fleet drill.	Fleet drill.	Fleet drill.	Fleet drill.	
27–2	30	Base.	Boston.	Base.	Base.	
Aug. 3–9	31	Fleet drill.	Fleet drill.	Fleet drill.	Fleet drill.	
10–16	32	Boston.	Base.	Base.	Base.	
17–23	33	Fleet drill.	Fleet drill.	Fleet drill.	Fleet drill.	
24–30	34	Base.	Base.	Base.	Base.	Annual boat r
31–6	35	Fleet drill.	Fleet drill.	Fleet drill.	Fleet drill.	
Sept. 7–13	36	Base.	Base.	Base.	Base.	Division foot and basket games.
14–20	37	Fleet drill.	Fleet drill.	Fleet drill.	Fleet drill.	
21–27	38	Base.	Base.	Base.	Base.	Prepare for t practice.
28–4	39	Target practice.	Target practice.	Target practice.	Target practice.	
Oct. 5–11	40	Naval review.	Naval review.	Naval review.	Naval review.	New York.
12–18	41	Docking period.	Docking period.	Docking period.	Docking period.	Division foot
19–25	42	New York.	Norfolk.	Boston.	Philadelphia.	and basket games.
26–1	43	Steaming trials.	Steaming trials.	Steaming trials.	Steaming trials.	
Nov. 2–8	44	Base.	Base.	Base.	Base.	Fleet foot ball games.
9–15	45	Fleet drill.	Fleet drill.	Fleet drill.	Fleet drill.	
16–22	46	Base.	Base.	Base.	Base.	
23–29	47	Fleet drill.	Fleet drill.	Fleet drill.	Fleet drill.	Fleet in New Y Nov. 26-30 Thanksgiving Army-Navy ball game.
30–6	48	Base.	Base.	Base.	Base.	
Dec. 7–13	49	Fleet drill.	Fleet drill.	Fleet drill.	Fleet drill.	
14–20	50					
21–27	51	Base.	Base.	Base.	Base.	Christmas lea
28–3	52					

NOTE.—The above schedule can be placed into effect regardless of what port is selected as a base, and with any modification being necessary of the present docking and overhaul periods.

DISCUSSION.

The Greatest Need of the Atlantic Fleet.

LIEUT.-COMMANDER N. L. JONES, U. S. Navy.—Lieut.-Commander Yarnell, in "The Greatest Need of the Atlantic Fleet," portrays in terse, vigorous terms the existing conditions in our battleship fleet; and outlines a schedule of employment upon which his hopes of a more efficient and contented personnel are based.

Mr. Yarnell's essay should be of profound interest to the whole service. The great conglomeration of units we call "the navy"—navy yards, naval stations, naval bases, the Navy Department itself—all exist for the fleet; the naval acts of Congress, the comity of nations on the western continent, the enforcement of our Monroe Doctrine, and the safety of the nation are based upon the size and efficiency of the fleet; and a carefully-considered estimate of its needs will naturally awaken keen interest in the proposed methods of remedying its deficiencies.

The writer has not the time or scope for discussing in detail the suggestions the essayist has so ably set forth, but a brief résumé of the steps taken by the Navy Department to uphold the fleet and increase the contentment, and consequently efficiency, of its personnel, follows.

Up to 1912, the Atlantic Fleet consisted of 17 battleships and a few auxiliaries, with torpedo and submarine flotillas as independent organizations; with no working base other than at Guantanamo, where it spent about 2½ months, and with the probability of repeating this rendezvous in the more temperate climate of Provincetown in summer. In January, 1912, the department requested the consideration of the commander-in-chief, Atlantic Fleet, upon the following proposals:

(1) Permanent assignment of torpedo flotilla to Atlantic Fleet.

(2) Assignment of active submarines to fleet.

(3) Formation of all supply, repair, ammunition and hospital ships into a train, with a regular train commander.

(4) Establishment of a base in Narragansett Bay as a rendezvous for the fleet.

(5) Keep the fleet at this rendezvous a good portion of each year.

(6) Establish and publish well in advance, periods of fleet maneuvers, target practice, steaming competition, divisional cruising, and overhaul at anchor at the base.

The commander-in-chief concurred in the department's recommendations, except as to the inclusion of the submarine flotilla and formation of a train, which he did not consider necessary at that time. His program for 1913 carried out these suggestions, with the exceptions noted.

The success of basing on Narragansett Bay was to a certain extent marred by an unfortunate controversy with the steamship lines entering the bay, over the anchorage taken by the fleet. This vexatious question has since been settled to the mutual satisfaction of the department and steamship companies.

In December, 1912, a board consisting of the Council of Aids and Surgeon

General met to consider health conditions in the fleet. This board made the following recommendations to the Secretary:

(1) Thirty days' leave to officers and men, to be distributed between overhaul period and Christmas holidays.

(2) Provide a large recreation building for the men, at Guantanamo.

(3) Ships to visit other than their repair ports some time during the year.

(4) A cruise to foreign ports other than West Indian waters, to be made as often as consistent with the work of the fleet.

In January, 1913, a memorandum embodying the board's recommendations, on the fleet's employment for 1913-1914, was submitted to the Secretary by the aid for operations. It briefly discussed conditions existing in the fleet and contained the following recommendations:

(1) Basing on Narragansett Bay throughout a good portion of 1913, for drills, maneuvers, and overhaul at anchor.

(2) A cruise of divisions or sections to the Mediterranean, with an alternative cruise to South American and West Indian ports.

(3) Such divisional cruising as will permit ships to visit other than home ports.

(4) A definite allowance, announced in advance, of an average of a week's overhaul at anchor for a week underway.

(5) The announcement of definite leave for officers and men, amounting to thirty days each year, to be distributed between the overhaul period and Christmas holidays.

This memorandum was approved by Secretary Meyer, who personally wrote upon it the following endorsement:

"APPROVED. We must give more attention to the contentment of the personnel, for we cannot have efficiency without contentment. A working base at Narragansett Bay for the greater part of the year; 30 days' leave annually for men and officers; occasional short foreign cruises; a definite schedule of movements of vessels of the fleets published to the personnel a full year in advance, are necessary steps in the direction of efficiency and contentment.

"The efficient upkeep of the motive machinery can be assured by allowing a full week for overhaul after a week at sea. The most satisfactory arrangement is to have alternate weeks at sea and at anchor overhauling, during the period when the vessels are operating from the working base."

To provide for closer co-operation of the fleet and the Naval War College, the president of the latter has been directed to prepare problems for the summer's work of the fleet; it is hoped to inaugurate a systematic and progressive series of problems of great benefit to the fleet and college, and to enable succeeding commanders-in-chief to take up the work where their predecessors left off. The department has also directed the establishment of a War College extension in the fleet, similar to those in Washington and Annapolis, which should further the interest of the fleet in questions of strategy, tactics and naval policy.

The earnest and cordial co-operation of the department and the fleet in establishing a more definite policy for the work of the fleet will go far towards the desired contentment and efficiency of the personnel.

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TRAINED INITIATIVE AND UNITY OF ACTION: THE TRUE BASES OF MILITARY EFFICIENCY.

By LIEUT.-COMMANDER DUDLEY W. KNOX, U. S. Navy.

Motto: "Concert in action makes strength."—JOMINI.

INTRODUCTORY.

In summing up his justly famed work on the Operations of War, Hamley makes an analysis of what he calls "the primary factors which have always been the foundation of success." According to this venerated authority there are two "indispensable factors": first, good *morale* (in which an approximate equality may in the future be expected among civilized nations), and second, a good *commander*. After the two indispensable factors, next in order are "*mobility, combination* and *fire-power*." "Mobility is spoken of here in the tactical sense—meaning rapidity of maneuvers on the battlefield"; fire-power needs no comment.

It is the purpose of this paper to treat only of *combination*, which, in the military sense, is the power to accomplish the *will* of the commander through the co-ordinated efforts of the several units of the command. Jomini says, "The guiding principle in tactical combinations, as in those of strategy, is to bring the mass of the force in hand against a part of the opposing army, and upon that point the possession of which promises the most important results." This then, in general terms, will be the aim underlying the dispositions of the commander, but it will not alone be sufficient for him to *will* (or even to order) a certain course of action; there must exist within the organization the mechanism of putting that will into effect—a means of overcoming the friction which is inherent in all operations involving the co-ordinated effort, the concerted action, of a large number of men

or units. To once more quote Hamley, " Combination depends on the efficiency of the chain of control connecting the brain of the commander through all grades down to the corporal's guard, on the intelligence of subordinate leaders in grasping and applying the commander's plans, on the discipline which insures intelligent obedience to the directing will, and on the mobility which gives rapid effect to that will and permits of fleeting opportunities being taken advantage of."

In operations preliminary to and in those succeeding a fleet engagement, the naval forces are usually widely scattered. The parts comprise single ships (scouting and doing other miscellaneous duty) and groups composed of scouts, screening forces, main body and train; between which, as well as between the forces afloat and the shore establishment, careful co-ordination is manifestly necessary. In addition to strategic and administrative co-ordination, it requires no great stretch of the professional imagination to appreciate in a general way the concert of effort that will be even more necessary, and far more difficult of attainment, in the field of tactics. There will be fast wing attacks on the flanks; destroyer threats and destroyer attacks, supported by cruiser groups; submarine and mining threats and attacks; torpedo threats and attacks by heavy ships; and changes of course, speed and formation. Not only must our own movements be planned and executed, but those of the enemy must be comprehended and met. Large groups of all classes will break up into smaller groups, and these again into still smaller ones; ships will often find themselves isolated; formations will be ragged; and confusion will frequently arise. All will happen within a few minutes—perhaps less than an hour will decide the action.

The fate of a battle is the happening of an instant. A decisive moment arrives when the smallest act decides and gives superiority.

In such a kaleidoscopic drama initiative and decision of the highest order will be almost continuously demanded of commanders, from the highest to the lowest. If each independent action, each hasty decision, fails to serve the *plan* of the commander-in-chief; if his *will* does not guide the ever changing situations, great and small, to seize fleeting opportunities, to ward off threatened disaster, and to comply with the guiding principles of tactics as interpreted by himself: then the various commanders will work at cross-purposes, the action of one will neither support

nor be supported by the action of another, and whatever is accomplished will be only negative. If fortunate, serious disorder among the fleet may be avoided while carrying on a purely passive "hammer and tongs" column fight; but no brilliant tactics nor decisive results can be hoped for; a spark of genius may flicker here and there, but will not survive its isolation.

To provide against humiliation and disaster, it seems imperative to supplement the present inadequate means for administering our affairs during peace or war, and for carrying on both strategic operations and fleet engagements. Neither signals, radio-messages, nor instructions, written or verbal, can suffice, either singly or in combination, to produce the unity of effort—the concert of action—demanded by modern conditions in a large fleet. Until this need is filled—a new means furnished—an able commander and a fleet possessing high *morale,* good mobility and great firepower, are in a measure wasted, since the power of combination is lacking. The skilful admiral will not have the means of using effectively his well-wrought instrument.

The necessity for and the difficulty of efficient co-ordination within a large force operating against an enemy being recognized, it will be interesting to examine into the methods of some of the greatest military leaders, to see how they solved this difficulty, and then finally to compare their methods with those now existing in our own naval service.

THE METHODS OF GREAT MEN.

Napoleon's method of field management consisted primarily of detailed instructions which aimed to foresee and provide for variations due to the movements of the enemy, accidents, the weather and other variable factors. It depended for success upon the care and skill with which the instructions were prepared and upon rigid obedience of the same to the letter. Realizing its weakness, though not having sufficiently long intervals of peace to prepare and substitute a better method, the great Frenchman supplemented it, when possible, by personal supervision of important operations; and, when long and close association with a marshal warranted it, an exception would be made and only *general* instructions would be issued to him. During a battle each situation, as it presented itself, was handled by verbal messages transmitted through mounted staff officers.

Napoleon's campaigns were conspicuously successful when the operations were small enough to permit his personal direction at every critical point. His genius was then of use wherever required. During one of the early Italian campaigns he constantly employed himself without sleep or rest for five days and nights. Those early Italian campaigns are by far the most brilliant in history, and, as is generally conceded, the only ones ever conducted by a commander without a single error of strategy or tactics.

Following Napoleon's military career it becomes plainly evident that, as the magnitude of the operations increased, his success diminished directly. Unless he himself could personally oversee and supervise operations, his system fell to pieces. This is conspicuously true of the Russian campaign and those succeeding it in Germany, where the numbers engaged and the fields of operation were very large. Examples occur of brilliant work on the part of his marshals acting independently; rarely, however, except when taking part in the same general campaign with Napoleon himself and when the marshal so acting was a pupil of long standing. Long and close association in the field had taught these what action they could expect from the Emperor under most circumstances, as well as what he expected from them.

His disasters, beginning with the Russian campaign and culminating at Leipzig, and again at Waterloo, must be attributed in part to the losses through wounds, death, or disaffection of such able and well-trained marshals as Lannes, Murat, Massena, and Augereau. Napoleon's system of centralization demanded, for success in large operations, lieutenants of long personal association. Napoleon himself, at St. Helena, in criticising certain of his marshals, frequently said that certain ones failed "because he did not understand my system." This in itself indicates that there could have been no other system except that of highly centralized authority, unsupplemented by any other school than that of war itself under the master.

Nelson and Von Moltke each used a method far superior to that of Napoleon for producing co-ordination or "combination." It consisted primarily in the issuing of general instructions only, but was in each case supplemented by a thoroughly worked out and clearly understood system of command, and by unity of doctrine.

Nelson's own conduct at the battle of Cape St. Vincent is well known and is a conspicuous illustration of initiative taken without

instructions. In commenting upon this action Mahan says, "The justification of departure from orders lies not in success but in the conditions of the case; Jervis was not one to overlook these, nor thereafter to forget that only one man in his fleet had both seen the thing to do and dared the responsibility of doing it." In regard to Nelson's methods Mahan states as follows: "Upon his own subordinates Nelson laid a distinct charge that he should expect them to use their judgment and act upon it with independence, sure of his generous construction and support of their action." Again, commenting on Nelson's famous memorandum before the battle of Trafalgar, Mahan says that it "is memorable not only for the sagacity and comprehensiveness of its general dispositions, but even more for the magnanimous confidence with which the details of execution were freely entrusted to those upon whom they had to fall." Probably the most striking illustration of all is Mahan's comment upon the famous signal before going into action at Trafalgar, as follows: "It is said that Collingwood, frequently testy and at the moment preoccupied with the approaching collision, exclaimed impatiently when the first number went aloft, 'I wish Nelson would stop signalling, as we know well enough what we have to do!'"

While the principles under which Nelson commanded his fleet were the same as those of Von Moltke, to the latter is due the credit of the widespread and detailed application of those principles throughout a large army.

In 1870, after only a few weeks of war, Germany, but a newcomer among the powers, had laid France, the once all powerful, prostrate. Europe and all the world were undisguisedly astounded. To what were these unprecedented results due? The numbers were about equal on each side. At the end of July the numbers were: German, 384,000; French, 250,000. By the middle of November they were: German, 425,000; French, 600,000. Germany had no advantage in the *morale* or discipline of her troops; the French commanders were the more experienced in war; the fire-power, mobility, and all other factors but one, were about equal in the two armies. The Germans far excelled the French only in the *power of combination*. To quote Colonel Henderson:

> It was understood, therefore, in the Prussian armies of 1866 and 1870, that no order was to be blindly obeyed unless the superior who issued it was actually present, and therefore cognizant of the situation at the time it was

received. If this was not the case, the recipient was to use his own judgment, and act as he believed his superior would have directed him to do had he been aware how matters stood. Again, officers not in direct communication with headquarters were expected not only to watch for and utilize, on their own initiative, all opportunities of furthering the plan of campaign or battle, but, without waiting for instructions, to march to the thunder of cannon, and render prompt assistance wherever it might be required. It was long before the system was cordially accepted, even in Germany itself; and it has been fiercely criticized.

To soldiers whose one idea of command might be summarized in the sentence, "I order; you obey," and in whose eyes unqualified and unthinking obedience was the first of virtues, the new teaching appeared subversive of all discipline and authority. If, they said, subordinates are to judge for themselves whether an order is to be executed or not; if they are to be encouraged to march, to attack, or to retreat, on their own volition; if, in a word, each of them is to be considered an independent commander, the superior can never be certain, at any given moment, where his troops are or what they are doing, and to maneuver them as a united whole will be out of the question. Was it likely, they asked, that a junior officer left to himself would act as his superior would have directed him to act had he himself been present? Was it not probable that he would hinder rather than further the general plan; and would not such untrammelled freedom lead to independent ventures, prolific perhaps of personal glory, but absolutely destructive of the harmony of action essential to success? These dangers, however, had been foreseen; and, while they were recognized as real, they were not considered so inevitable as to forbid the encouragement of an unfettered initiative, nor so formidable as to be insurmountable. The first step was to make a clear distinction between "orders" and "instructions." An "order" was to be obeyed, instantly and to the letter. "Instructions" were an expression of the commander's wishes, not to be carried out unless they were manifestly practicable. But "orders" in the technical sense were not to be issued except by an officer actually present with the body of troops concerned, and fully aware of the situation; otherwise "instructions" only would be sent. The second step was to train all officers to arrive at correct decisions, and so to make certain, as far as possible, that subordinates, when left to themselves, would act as their superiors would wish them to do. The third step was to discourage to the utmost the spirit of rash and selfish enterprise.

In commenting upon these principles Henderson states as follows:

The benefit to the state was enormous. It is true that the initiative of subordinates sometimes degenerated into reckless audacity, and critics have dilated on these rare instances with ludicrous persistence, forgetting the hundreds of others where it was exercised to the best purpose, forgetting the spirit of mutual confidence that permeated the whole army, and forgetting, at the same time, the deplorable results of centralization in the armies they overthrew. It is inconceivable that any student of war, comparing the

conduct of the German, the French, and the Austrian generals, should retain even the shadow of a prejudice in favor of blind obedience and limited responsibility.

"To what," asks the ablest commentator on the Franco-German war, "did the Germans owe their uninterrupted triumph? What was the cause of the constant disasters of the French? What new system did the Germans put in practice, and what are the elements of success of which the French were bereft? The system is, so to speak, official and authoritative amongst the Germans. It is the initiative of the subordinate leaders. This quality, which multiplies the strength of an army, the Germans have succeeded in bringing to something near perfection. It is owing to this quality that, in the midst of varying events, the supreme command pursued its uninterrupted career of victory, and succeeded in controlling, almost without a check, the intricate machinery of the most powerful army that the nineteenth century ever produced. In executing the orders of the supreme command, the subordinate leaders not only did over and over again more than was demanded of them, but surpassed the highest expectations of their superiors, notably at Sedan. It often happened that the faults, more or less inevitable, of the higher authorities were repaired by their subordinates who thus won for them victories which they had not always deserved. In a word, the Germans were indebted to the subordinate leaders that not a single favorable occasion throughout the whole campaign was allowed to escape unutilized."

OUR OWN METHOD.

It is hardly necessary to enter into a description of our present system of command—that is familiar enough to us all. Generally speaking it consists first, of "detailed instructions which attempt to provide for every contingency," and second, where the conditions of the case make it possible, of "general instructions supplemented by long and close personal association." There is of course much that is good in the system. It has produced many achievements of which we are justly proud. As a system, however, it can scarcely be classed with that of Nelson and Von Moltke; it has never stood the supreme test of a large fleet action against a formidable enemy; and it is safe to say that even our greatest triumphs were accomplished in spite of glaring system faults which most of us will candidly admit. These are unfortunately of the sort which will count most against us as the size of forces, and consequently the complexity of operations, increase. Some of our faults are summarized below to serve as illustrations, though the list is not exhaustive, and others will occur to the reader:

(a) *The present system breeds and fosters a spirit of hostile criticism towards those in authority.* An atmosphere of this sort

has permeated the service for a great many years. All must admit that such a condition is lamentable; not only does it prevent that mutual sympathy and understanding essential to co-operative effort, but it also wofully undermines discipline—the primary requisite of military efficiency. So keenly does the writer deplore this most unfortunate tendency towards adverse criticism, that he is loath to go further in the dissection of our own system. On the other hand a frank examination of existing conditions, with free-minded though friendly admission of defects, is a very healthful process; and it will be doubly justified if by such means corrective measures can be evolved which will eliminate this intolerable evil.

By some the condition of an unfriendly attitude in our service towards authority has been attributed to the American viewpoint and temperament; but, inasmuch as it is known to exist in like degree in some foreign services similarly administered, this explanation is untenable. Hardly more than a superficial analysis of our system is necessary to discover more reasonable causes. Some of them follow: (1) The reasons which govern the actions of seniors are often needlessly kept secret. (2) Juniors lack proper elementary military instruction and fail to truly appreciate the *military* necessity for unqualified support of, and loyalty to, authority. (3) There is lacking that mutual confidence which is born of common doctrines and of practiced co-ordination of effort. (4) The task of each person is not always clearly defined nor restricted to its proper area. When a junior is interfered with while executing work properly assignable to him, hostile criticism of his seniors is a natural consequence. Whenever a senior neglects work within his proper province for the sake of giving greater personal attention to duties intended for his subordinates, unfriendly criticism is inevitable. (5) The occasional too rigid enforcement of the letter of regulations. Spencer Wilkinson says, "In a narrower sense discipline is maintained by routine. There is a code of regulations to which all must conform. The danger is that weak persons in authority are apt to confuse the form with the substance, and to take the modern conditions, the better organized code of regulations, for the essence of discipline, mistaking the means for the end and the letter for the spirit. A man devoid of judgment may so misuse lawful authority, that without violating the letter of a military code, he may arouse the spirit of disobedience among his subordinates. Discipline is then at war with itself and the results are disastrous."

The spirit of hostile criticism creates scattering of effort, lost motion, working at cross-purpose, and a generally discordant condition; it is indispensable that it be eradicated from the service, before effective co-ordination can be attained. "E pluribus unum" seems lost to the nautical understanding; forgotten in the realm of Neptune. No plan can succeed well without a spirit of loyalty among the several executive elements. Military efficiency cannot be maintained without true discipline, which is only an empty form unless the spirit of the service breathes common understanding, intelligent obedience, and loyalty to authority.

(b) *Only in exceptional cases do young officers get sufficient training in initiative and responsibility to fit them for the higher positions which they are destined to fill in later life.* The prize essayist of 1909, Lieutenant E. J. King, says:

> Responsibility and the accompanying exercise of authority, ability, and judgment are indispensable factors in the education of an officer; our officers have too little opportunity in this direction while in the lower grades. They command their divisions only at certain times and under certain circumstances, in most of which they are expected to adhere to certain dispositions already made for them. At present the only opportunity afforded officers commanding gun-divisions to show their ability is at target practice, and even this is an innovation of recent date. Lack of responsibility and the accompanying opportunities to exercise authority, ability, and judgment have often been cited as reasons for attaining command (of ship) rank at an earlier age than obtains in our service. Certainly officers should attain the rank necessary to command ships at an earlier age; but, certainly also, an officer's career should be such that the requirements of the command of a ship should differ from the requirements of the command of a division in degree only. At present our system, if system it can be called, does not call for these requirements to the proper degree while an officer is in the lower grades; *i. e.*, in command of a division.

Entirely apart from their proficiency in other respects, a group of officers, whether divisional officers in a ship or, especially, commanding officers of ships in a fleet, cannot efficiently co-ordinate their efforts in battle unless each individual possesses the power to quickly and automatically assume initiative and responsibility. Unfortunately the human brain does not respond automatically to any sudden situation unless it has been prepared by training to do so. Proper response is particularly difficult while the individual is under any unusual mental agitation, such as that prevalent in action. Daudignac says:

> The psycho-physiological disturbances produced . . . . in the presence of

danger . . . . are habitually expressed under the form of collapse or under the form of agitation. There is produced:

(1) Enervation of the will muscles, trembling, arrest in movements, which thereby become disordered and feverish.

(2) Checked respiration, oppression and restriction of the throat, from which result involuntary vibrations; man is no longer master of his organization.

(3) There is spasmodic contraction of the vessels, paleness, afflux of blood to the heart, dilation of pupils, etc. What is the result? The irrigation of the cerebral cells being modified, man is affected in his intellectual faculties, association of ideas is interrupted, and power of judgment and attention diminished.

Balck says:

Our modern personnel has become much more susceptible to the impressions of battle. The steadily improving standards of living tend to increase the instinct of self-preservation and to diminish the spirit of self-sacrifice. . . . . The fast manner of living at the present day undermines the nervous system . . . . in addition the nerve-racking impressions on the battlefield are much greater at present than in the past.

The nerves will probably be more severely taxed by terrifying impressions in a sea fight than on shore, and, while this may be somewhat compensated for by greater isolation whereby a smaller proportion of the force will be affected, it must be borne in mind that as a rule only one big fight will occur afloat and the number of veterans will therefore be very small.

Under these conditions the most vigorous possible peace preparation of the automatic functions of the brain is positively indispensable. Otherwise there cannot be even limited assurance that responsible subordinates may be depended upon in battle to think quickly and clearly, to make proper decisions, and to take that initiative and assume that responsibility which is so necessary to effective combination. Preparation of this sort can be a product only of long training; a process of cramming is futile; its potent quality is judgment under pressure which cannot be acquired except through frequent "obligation to decide important practical issues, coupled with the certainty of being called to account for failure." (Wilkinson.)

The necessity for this kind of mental training being admitted, it remains to emphasize the importance of beginning the same during youth and continuing it systematically throughout an officer's career.

It is a fact generally accepted by authorities on the psychology

of mind that for the average person above the age of about fifty years, newly acquired knowledge is not readily assimilated; that it does not become an unconscious part of the brain, but remains alien, is obviously "grafted" upon it, and is not subject to automatic use as is knowledge acquired at an earlier age. This age also marks about the turning point in a man's ability to adapt himself to new habits of thought or mental processes, and this ability varies inversely with age. These facts, while indisputable, have frequently been frowned upon because of their assumed implication of a reflection upon older officers; such, however, is far from being true. A properly trained older officer—by which is meant one whose mind is "grooved" to initiative, responsibility and other command qualities—is much better material (even ignoring his superior experience, judgment, and professional attainments) with which to effect combination, than is a properly trained young officer. One "cannot teach an old dog new tricks"; the grooves in the brain of the older man are deep, and will control better in the face of difficulties than will the more shallow furrows of the younger man. On the other hand older officers who have not had proper early training will ordinarily prove less capable in emergency than the untrained youngster, because the mind of the latter is the more pliable and can more readily adapt itself to the unexpected condition.

Farragut said:

> As a general rule, persons who come into authority late in life shrink from responsibility and often break down under its weight.

This great man was over sixty when his most brilliant work was done, involving initiative and responsibility of the highest order. But his record shows how well he had been prepared for it—how well his mind had been grooved to it. He came into command at the ages of 12, 18, 22, 33, 37, 41, 46, and 57. Some of these involved responsibility and authority well beyond his years and rank, and continued through a considerable period of time. Another conspicuous example of a man well trained while young, who exercised high command with marked success at an advanced age, is Von Moltke, who was over 70 during the Franco-Prussian war.

As further evidence that age alone is no bar to efficiency in high command we can all recall personal association with officers old in years yet vigorous in the qualities of command. Is it not a fact

that nearly all of these had had the fortunate preliminary training as younger men?

As a most important step then towards developing in the navy the "power of combination"—the "driving power"—it is necessary to make individuals efficient in two of the essential elements of combination; viz. *initiative* and *responsibility*. One of the greatest faults in our present system is the failure to scientifically and systematically (instead of haphazardly) develop these two qualities in officers at the time of life when such training is effective in molding the individual. Because in the present generation command rank is not reached until middle age, is not sufficient reason for failing to develop in the younger officers the essential qualities of command; on the contrary it is the strongest of reasons for so doing.

(c) *There is no well-defined doctrine of command—no codified set of rules governing the relations between seniors and juniors.* Personal acquaintance in the official sense furnishes the only safe guide by which a junior may now guess how much initiative is expected of him; and when he may and when he must not depart from the letter of instructions. The same limitation (personal acquaintance) is imposed on a senior in his assumptions concerning the manner in which his orders will be executed. Ordinarily neither senior nor junior can know just where the dividing line is between their two functions; that is, of the co-relative matters not specially mentioned in the orders, what share will be assumed by each, and what reliance can be placed on the other for attending to the remainder. In view of the fact that at present the natural differences due to personality are in no effective manner leveled by application of common administrative principles, as should obviously be done, almost every change in seniors involves more or less radical changes in administrative methods and in the principles of command. In extreme cases these principles have changed from day to day even when no change of personnel has occurred.

Probably every ship in the service is organized and administered differently, depending upon the personalities of their respective commanding and executive officers. Recent cases are known where it was the custom for the commanding officer to personally supervise and direct the most minute details of such work as the painting and cleaning of the ship, and to personally direct the officers of the deck during a great part of the day in nearly every

matter that might arise, great or trivial. Contemporaneously in the same fleet the first lieutenants of other ships were allowed exclusive charge of the painting and cleaning and the divisional officers were permitted great latitude in carrying on their division work and watch duty. Between these two extremes could be found almost any degree of authorized initiative and responsibility for juniors in every branch of their work.

The above are differences, not of details, but of principles, and the fact that they exist to-day in our fleets furnishes a great argument for the introduction into the service of a uniform system of command. Under present conditions it is almost impossible for a young officer to formulate in his mind, as the result of his experience, a consistent, logical system for his own guidance in the daily performance of his duties. As soon as one is perhaps fairly started, a change of seniors occurs and a complete upheaval is very apt to follow. This process has been going on for years. What confusion of ideas may we then reasonably expect in the minds of officers of all ranks on the subjects of administration and command?

It requires but very simple analysis to understand that co-ordination cannot exist without common doctrines, not alone of command, but of administration, of strategy, and of tactics, as well—we must have a common denominator, must speak the same language, or else confusion in the *combined* obedience to an order will surely follow. Such confusion occurs now almost daily in the fleets about the simplest matters; how much greater then must we expect the confusion to be just preceding and during a fleet battle, when even the simplest of general directions can be transmitted only with great difficulty.

It is probable that the proper development of the younger men in the past has not matured partly because of the danger in trusting too blindly to one who may misinterpret the intention of the superior on account of inability to grasp the same viewpoint.

Initiative is a double-edged weapon dangerous to trust in the hands of subordinates who are liable to misconceive the mind of the chief and are unable to read a situation as he would read it. The keen sword of initiative has no place in the armory of those who hold the "Doctrine of no doctrine." *Edinburgh Review.*

It is perfectly true that the amount of discretion allowed a subordinate must in some degree depend upon the commander's personal knowledge of him. Even Griepenkerl says:

In practice the amount of independence allowed a subordinate depends on his personal character; a factor that is wanting in the theoretical solution of problems. Yet even in practice the commander of the whole force is sometimes justified to encroach on the domain of even his most tried and trusted subordinate; for the continuity of the whole, the unity of leadership, and the leader's own views and intentions outweigh all other considerations. The preservation of the independence of the subordinate officer must not be overdone. But hampering him with unnecessary details is a much greater error. You must have very good reasons for interfering with your subordinate's freedom of action.

The Germans can, better than ourselves, afford to inject the personal acquaintance factor as a part of their system. In their service the tenure of high command is long, and in consequence seniors and juniors have an opportunity to become thoroughly acquainted under actual conditions of service. With us, on the other hand, there is grave danger of accepting this factor with too great equanimity. Since the tenure in high command is so short it becomes all the more imperative that our *system* be well based upon thoroughly *trained* officers who can be relied upon for uniformity of decision and conduct under given conditions.

Rather than be deterred on account of insufficient doctrines from developing the attributes of initiative, responsibility and loyalty, in younger officers, it would seem better practice to develop simultaneously both the attributes and the doctrines, since both are vitally essential to reasonable success in modern war, and particularly indispensable to efficient combination.

(d) *The mass of detail handled by those in high positions unduly restricts their time and attention available for more weighty matters.* The condition is particularly acute and lamentable in matters of administrative routine, where, having become firmly entrenched in every day use as a prominent factor in our systems, it is injected automatically into everything that is undertaken, from the piping down of wash clothes or the transfer of an enlisted man, to the management of a target practice.

The causes of the condition are numerous and in part obscure: some of them are summarized below:

(1) Custom and regulations combine to sap the time and energies of those in authority by demanding their attention specifically to many trivialities. (2) The tendency is persistent to hold the top man responsible for the most minute detail without specifically authorizing him to delegate insignificant authority

and responsibility. (3) The ship organization as a rule fails to fix clearly the duties and responsibilities of each officer and petty officer. The machine, therefore, requires constant supervision, since the properly subsidiary work of maintenance and operation is in no sense automatic. (4) There is a failure to authorize or to recognize a clear cut "province," or "area of discretion" of subordinates; and a human tendency always for seniors to meddle in the routine work of juniors, due partly to greater familiarity with the work of the latter than with their own.

When one stops to consider the question, it is of course obvious that if the head of a large organization attempts the personal direction and supervision of too many details, his own true work or mission must suffer; and in addition, when an unusually strenuous test is demanded of the organization, such as that imposed on a fleet by war, the power of combination is seriously impaired by a habit, acquired previously, of the important leaders looking ever downwards instead of upwards. Griepenkerl says:

> The commander attends to very few details, as above all things he must endeavor to retain *a general supervision over his whole force.* Should he attempt to arrange too many details, or interfere everywhere with orders, he would dissipate his energies and lose the power of supervision. . . . . there is nothing to be gained by such personal interference of subordinates, as he would be assuming duties intended for his subordinates while his own, for which he needs his individual attention and bodily strength, only too easily would suffer from neglect.

And again, commenting upon an engagement:

> The temptation will be very great for General A—— to interfere with the main attack by sending it orders, because he would like to see it handled as he himself would handle it were he in immediate command; but such interference would be a great mistake, except it be absolutely necessary, as it might run counter to the plans of the subordinate commanders and fatal disorder would be the result.

Co-ordinated effort requires fundamentally; *first,* a division of the work into tasks, each suited to the office, the capability and the capacity of the individual to whom it is assigned; *second,* a degree of independence for each individual in the performance of his allotted task, duly recognized and respected by those higher in authority; and *third* (not pertinent to the fault under discussion but inserted to complete the trio of fundamentals), complete loyalty of the subordinate to the general plan of the commander.

(e) *Undue effort and prominence is given to administration.*

The ordinary every day duties of administration have grown to be so exacting and to be considered so imperative, that the execution of any special task is accompanied by undue internal friction. Those in authority are snowed under with administrative details (the combined result, as previously pointed out, of regulations, custom and their own volition); and, being thus primarily occupied, little time can be spared for the special task of the day, or for professional study, an essential preparation for war.

Certainly, administration (maintenance and internal operation) is an important function, not only in peace but also in war, but certainly also its importance is subordinate to other functions. Preoccupation in it should not blind us to the fact that by means of scientific organization and high *morale*, upon which administration is based, its burdens can be very greatly lessened, nor to the fact that administration is but a means to an end and not the end itself. In peace it furnishes a basis for carrying on the special task, and in war it is the machinery of strategy and tactics. If too much time is given to it during peace, at the expense of the special task, the habit will survive during war, regardless of sincere efforts that will probably be made at that late day to reform. This is perhaps the best reason why we should organize and manage our affairs during peace so that those routine and administrative matters, which during war must necessarily be carried on co-incidently with the more serious business, should run smoothly, automatically and without the attention of those occupying high military positions.

Unless this be done now, while there is time to stamp it indelibly as a part of our system, we shall find that during war our leaders will each have a task exceeding practicable dimensions, and, together with other important elements, the power of combination will suffer.

Spencer Wilkinson says:

> The two functions of directing the movements so as to secure victories, and of managing the great business concern, have little in common . . . . it is easy to see that the chief department of any fighting organization must be that which designs and directs the fight . . . . (in Prussia) the distinction was steadily kept in view between the all important conduct of the operations against an enemy, and the subordinate though necessary business of administration.

(f) *The system of highly centralized authority renders it necessary to issue lengthy orders covering a great number of*

details. These are not only very difficult to prepare with even approximate perfection, but they are very difficult for the recipient to digest and execute in the manner desired by the issuing authority. Last winter in the Atlantic Fleet, for example, it was necessary to issue thirteen pages of single spaced typewriting to carry out three simple battle exercises. The number and length of orders and instructions covering a multitude of subjects great and small, issued by high authority, has grown to tremendous proportions, until it unduly taxes the time of all officers to read over the orders issued, and to keep themselves and their subordinates informed with respect to the contents of the same.

Co-ordination will manifestly be made difficult, in the heat of war, by a personnel habituated to operate only through the medium of excessively long and detailed orders. The pressure of conflict will force the substitution of short, concise general instructions, which in combined operations will surely produce serious confusion, unless their execution is undertaken by subordinate commanders trained to the method and possessing common doctrine of every variety. How often will the failure to execute an important detail be excused by a statement similar to the following: "It should have been done, the necessity for it was obvious, but I had no orders to do so," or the failure to complete some overlooked or unforeseen but essential link in the chain by "my orders were to do so and so, and I had no authority to depart from them."

Von der Goltz says:

> The spirit of the initiative urges to independent action. It renders armies strong. We rightly adhere to the principle that, in the case of an officer who has been guilty of neglect, an excuse to the effect that he had received no orders is of no avail. Passive obedience is not enough for us, not even the mere fulfillment of what has been enjoined, when the occasion has demanded that more should have been done.

Lengthy, detailed orders kill initiative, and engender a spirit of blind obedience to the same to the letter. This is necessarily fatal to combined action because the great objectives are obscured by the mass of detail, and, when the unexpected happens which has not been provided for in the orders (as invariably occurs), the subordinate is not clear as to his mission and is not prepared to further the spirit of the general plan of his commander. Frequently he is deterred from taking any action, without specific

subsequent instructions, for fear of actually harming the execution of the general plan.

The German Field Service Regulation requires an order to contain all that a subordinate must know to enable him to act on his own authority for the attainment of the plan of the commander, *and no more.* Von Moltke's order to move 200,000 men into the field of Gravelotte could be typewritten double spaced on one page. It contained 120 words.

(g) *Until given command it is not known what qualifications an officer has for the same.* There being no systematic training in initiative and responsibility, an officer's first training in these command qualities are frequently co-incident with his assignment to an important and responsible post. In consequence it can rarely be foretold with accuracy what efficiency will be shown by a young commander confronted with his first serious responsibility. Many who give promise of being able commanders fail under this crucial test. A system which, from the beginning of an officer's career, forces the development of the indispensable qualities of command, would not only furnish a formidable driving power in all combined undertakings, but would also eliminate to a great degree the uncertainty now existent regarding the fitness of officers for responsible command before their appointment to the same. Instead of such commands being used as a school for the training of commanders, they would become the instrument through which the energies of efficient men could be devoted towards creating and maintaining a higher efficiency than is now known.

A REMEDY.

In the modern industrial world reformation and development of system are accomplished through four distinct processes, which, according to the authorities in this so-called "scientific management," are applicable in principle to all forms of human activity; they are: 1. A critical examination of existing conditions by experts; 2. Specific recommendation by said experts of a comprehensive plan for betterment; 3. An accurate and detailed recording of results obtained in the practical working of the new plan; and 4. A periodic analysis of the results obtained, with a view to further improvement.

While disclaiming emphatically any intention to pose as an expert on the subject, the writer has in the foregoing paper attempted

partially the first step of reformation; that is, critical examination of existing conditions. In order to furnish a satisfactory basis of reasoning and comparison, this has been preceded by an examination of the parallel systems of a few of the great military leaders. He is inclined to rest the case here and omit the second step: that of a specific recommendation of a comprehensive plan for betterment. This, not from lack of positive beliefs on the subject, but because the defects in the existing conditions will in such manner be better emphasized, and because any discussion that may be stimulated by this essay will not fail to recognize the existence of the evils stated. Remedies are at best but tentative, yet the weight of criticism frequently falls upon them, thus obscuring the main point at issue. It is reserved for genius to draw up perfect plans for future guidance. The best that the rest of us can do is to propose something which will serve as a temporary basis for action, specifically and frankly subject to such revision as experience may make desirable in the collective opinion of the service at large; which after all is a good substitute for genius.

The writer would prefer to limit remedial measures to recommending the appointment of a board of experts, in accordance with the best industrial practice, to take the subject under exhaustive consideration. But, for the sake of completeness, and also on account of the strong and well-founded service prejudice against purely "destructive criticism," of which misdemeanor he prefers not to be guilty, the following outline of corrective measures is submitted, with considerable diffidence, and with the reservation that it be considered mainly illustrative, and at best as a basis upon which a tentative beginning may be made.

A. That the department announce as its policy, that, three months after the publication of the order on the subject, the doctrine of the "initiative of the subordinate" shall govern the relations between seniors and juniors. That this doctrine be defined in general orders as follows:

RULE I.

All forces shall be organized into groups, each subdivided into minor groups, for tactical and administrative purposes. These shall be:

Fleets (tactical and administrative).

Squadrons (tactical and administrative).

Divisions (tactical only).
Ships, tactical and administrative.
Ship Departments.
Ship Divisions.
Squads.

Every group shall have a commander whose duties and responsibilities shall be clearly defined and understood.

Normally the commander of any group shall deal only with the group commanders next above and next below him in the organization.

RULE II.

"Orders" will be differentiated from "Instructions" as follows:

(a) An "order" is to be obeyed, immediately and to the letter, but will not be issued except by an officer actually present and fully aware of the situation.

(b) "Instructions" express in general terms only, the commander's wishes or "will" and will be carried out only when manifestly practicable. They acquaint a subordinate with his mission, and he is responsible for the detailed manner of their execution as well as for the results of his work as weighed against the difficulties encountered.

RULE III.

In the detailed execution of instructions, subordinates are required to restrict themselves rigidly to the general plan expressed by their superior.

Subordinates will not ordinarily be interfered with in the detailed execution of their instructions unless it becomes necessary to do so to prevent injury to life or limb, or material injury to property; or unless the successful issue of important affairs would otherwise be jeopardized. Criticism should be reserved until after the completion of assigned duty.

The maximum amount of discretion consistent with success and reason will be given to subordinates on all occasions.

These rules are not intended to reduce any authority now existing; but to facilitate the accomplishment of important work and to extend and improve means for executing the will of those in authority.

RULE IV.

Seniors will exercise patience and forbearance with juniors during the latter's execution of instructions, with a view to their development through experience rather than precept.

RULE V.

Seniors will exercise leniency towards juniors when it is apparent that mistakes have been made only through inexperience and not on account of carelessness or lack of proper effort. Particular leniency is desirable when mistakes occur through overzealousness and where the aim, in spite of bad execution, may be commendable or well judged.

RULE VI.

Moderate praise should never be omitted when merited.

It is the clear duty of seniors to give censure whenever the same is deserved. Effort should be made to have it understood that all censure is purely impersonal.

B. That between the date of the receipt of the order and that set for it to become effective, all officers be required to read and report in writing that they understand the following:

Henderson—" Science of War," Chapters I and XII.

Von Spohn—" Art of Command."

Von der Goltz—" The Nation in Arms," Sections II and V.

C. That (between the above dates) weekly meetings of all officers be held on board every ship and at every naval station, for the purpose of discussing and studying the principles involved and for the collective reading of Griepenkerl's " Letters on Applied Tactics."

D. That the department's order promulgating the doctrine be posted in every cabin, wardroom, and junior officer's mess room for a period of six months after its publication.

E. That examinations for promotion include questions on the principles of command. To be effective in indoctrinating the service such questions should be framed at least in part on the applicatory system, *i. e.*, the system of " cases " or specific problems.

F. That on board every ship in commission one afternoon a week be devoted by officers to the study of war, including tactical and strategic games played under war college conventions.

In suggesting the foregoing remedy it is recognized that:

1. Before a radical departure from custom and regulations can be tolerated, the sanction and authority of the department are necessary.

2. A doctrine of command to be effective must be uniform and very widely diffused throughout the service. For this purpose general departmental orders are necessary if it is to be accomplished without undue delay.

3. Compliance with an order is not intelligent unless the purpose of the superior is understood.

4. The general acceptance of a doctrine cannot be brought about through orders alone, but these must be supplemented by a general study of the principles involved, and by frequent applicatory exercises.

5. "The time is coming when all great things will be done by that type of co-operation in which each man performs the functions for which he is best suited, each man preserves his own individuality and is supreme in his particular function; and each man at the same time loses none of his originality and proper personal initiative, and yet is controlled by and must work harmoniously with many other men." (F. W. Taylor in "Principles of Scientific Management.")

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LOGISTICS—ITS BEARING UPON THE ART OF WAR.*

By COMMANDER C. THEO. VOGELGESANG, U. S. Navy.

This subject is one of such magnitude that it would be presumptuous to claim that what follows is even a review of its essential features.

The effort in this paper is to throw what little light I can upon one of the too often neglected branches of study in the Art of War, with a view to awakening our minds to its controlling importance.

This paper therefore will be an attempt at a brief discussion of logistics under the following heads:

(a) Definition.

(b) The importance of a proper comprehension of our duty in respect to knowledge of logistics.

(c) The relation that exists between logistics and strategy.

(d) The necessity of considering quality as well as quantity in supply, and the limitations thereby imposed on logistics.

(e) The influence of logistics upon the type of war to be waged.

(f) The importance of solutions of logistic problems in time of peace.

(g) How logistics is involved with peace strategy.

(a) DEFINITION.

The term "logistics," as applied to military science, has been given various interpretations by military writers, differing essentially in the extent of its application. Strangely enough, writers differ even in the derivation of the term; but the latest authorities seem to have correctly established both its derivation and its application.

* A lecture delivered at the U. S. Naval War College.

Jomini derives the word "logistique" from the duties of the Major General des Logis, to apportion cantonments to the troops.

Farrow's military encyclopædia has this to say under the heading Logistics:

Bardin considers the application of this word by some writers as more ambitious than accurate.

It is derived from Latin "logista," the administrator or intendant of the Roman armies.

It is properly that branch of the military art embracing all the details for moving and supplying armies. It includes the operations of the Ordnance, Quartermaster's, Subsistence, Medical and Pay Departments.

It also embraces the preparation and regulation of magazines for opening a campaign, and all orders of march and other orders from the General-in-Chief relative to moving and supplying armies.

Some writers, however, have extended its signification to embrace strategy also.

The latest authoritative French source gets as usual to the root of the matter and clears up the whole subject.

I will quote from the *Dictionnaire Militaire* an epitome of the French digest:

Logistique—Derived from the Greek, meaning the technique of numerical calculation, and employed in military language to mean the science of all that is concerned with military statistics and the speculative study of military art, of theaters of war, and of places of war.

Up to the end of the eighteenth century logistics was held to include everything embraced within the scope of knowledge of a General-in-Chief. This conception of logistics has filled the books of writers and military professors, so rich in theories and pedagogic speculations, even up to the present time.

The word "strategy" subsequently replaced the word "logistics" with writers and military professors, drawing its origin also from the Greek and defined more or less vaguely as the science of the strategist—of the General-in-Chief.

This definition is, however, too comprehensive to be clear.

The term "logistics" has therefore been reserved as applying to those laws according to which one provides for the feeding, marching, and resting of troops in the field in the best order and in security.

Such is the definition given to it in the School of Application of Artillery and Engineering, in the course on Military Art, of which Logistics forms the third part.

Logistics comprehends all the operations conducted outside the field of battle, and which lead up to it. It regulates the execution of those movements which in combination become the functions of strategy; for example, marches, cantonments, transport and feeding of troops. That is to say, it corresponds to that which we call the "Science of the General Staff."

With our minds somewhat cleared up in respect to the true meaning of the term, we are perhaps better prepared to consider the application of this branch of military science to the conduct of war.

(b) THE IMPORTANCE OF A PROPER COMPREHENSION OF OUR DUTY IN RESPECT TO A KNOWLEDGE OF LOGISTICS.

In no branch of the Art of War can we more surely and quickly increase our knowledge than in the Science of Logistics. For here we deal with facts and not fancies. Here the demands of the art are calculable and solvable by rule and method, and cause and effect are only separated in many cases by a problem in simple arithmetic.

Hamley, in his "Operations of War," after going into some detail on the subject of the supply of an army in the field, taking as a concrete example the French army in its Italian campaign of 1859, says:

> At the risk of being tedious, we have given some of these details, because for want of them readers of military operations are often insensible to the vast preparations required for the commencement of war between great powers, and to the nature of certain facts which must enter into military calculations, and which, though they seldom appear on the surface of history, form the great elements of perplexity for governments and generals.
>
> Sending forth an army is like sending forth a city equal to the capital of a great state, transporting it, with all its means of food and shelter, from place to place, at uncertain times and in unforeseen directions, and leaving it all the time entirely dependent on the territory from which it set forth for the maintenance of its numbers and the supply of its daily wants.

In that paragraph the author sounds a note of warning that cannot be too carefully heeded by us. We may have little to do directly with shaping the military policy of our government, but we shall unquestionably be held responsible for the execution of our part of that policy in time of war.

There is an excuse for the masses of a peace-loving and peace-professing nation, in failing to comprehend the necessity of preparation for, and the vastness of the effort entailed in carrying on war; but there is no excuse for us, as students and embryonic practitioners of the art, if we fail to comprehend and give due weight to this important function of war.

We at least should be prepared and able to advise with judgment and from knowledge concerning military needs in time of peace as well as in war, and if we are schooled and our judgment is trained, we must eventually be, indirectly it is true but none the less forcibly, the shapers of our naval policy.

(c) THE RELATION THAT EXISTS BETWEEN LOGISTICS AND STRATEGY.

The necessary thing to be borne in mind is the relation that exists between logistics and strategy.

According to the definition with which we started, namely, that logistics is concerned with operations conducted outside the field of battle, and leading up to it, logistics has no direct bearing upon tactics. And this appears to be manifest.

But in its relation to strategy, logistics assumes the character of a *dynamic force, without which the strategic conception is simply a paper plan.*

The strategic conception may be that of a genius, but, if it be not based on a solid foundation of logistic facts, it can have no force and will be of no effect; unless, indeed, it lead direct to disaster.

There can be no more striking example of this than is evidenced in the campaign of Napoleon in 1812-13, in his march to and retreat from Moscow.

Here the greatest genius of war in the Christian era was prosecuting a campaign grander in its conception and possibilities than any ever before or since conceived. He was not unmindful of the demands of logistics, for no general that ever lived was more painstaking in its details. But it seems in this instance as if the very magnitude of the operation defeated its own ends. With over half a million men with the colors, Napoleon advanced against less than half that number of Russians, who, retreating deeper and deeper into the heart of their own country, led on the greatest master of the art of conducting war, until his thirst for a

decisive and complete victory, often promised but never fully realized in this campaign, blinded him to or made him careless of the necessity of supplies.

Logistics was strained beyond the limits of reason; calculation could not support the demands of the strategic conception. Such utter rout and disaster followed the enforced retreat from Moscow that, of the magnificent army of over half a million, there were assembled with the colors, after the Deresine was crossed, scarce 10,000 men.

Jomini, in summing up the causes of the disaster that befell the French in the Russian campaign, says:

> The principal error was in not recognizing that an army numerous enough to conquer peace in Russia could not be subsisted there if the Russians conducted a retreating campaign and led it into the heart of the country. If a decisive battle could be early won, success was probable; if not, Smolensk was the farthest point that, in 1812, could with safety be reached.

Napoleon in this campaign did not heed the teachings of the military historian Montesquieu, with whose writings he must have been familiar, and who, about 50 years before that campaign, wrote the following:

> Great and distant enterprises perish by the greatness of the preparations which have been made to ensure their success.

Is there not for us in this a lesson to be drawn? In the nature of things, does the future hold out for us a possible necessity for conducting war beyond the seas? Does not that imply, as we stand to-day, long, attenuated lines of supply?

Have we figured out the actual amount of supplies—coal, oil, ammunition, and stores—that will be necessary to support an over-sea expedition? Or, having figured that out, and having harmonized, as General von der Goltz says, the *being able to with wishing*, have we calculated the number of vessels and their tonnage capacity that will be necessary to keep our force supplied?

Having done that, have we listed the available vessels so that we may have at our command within 30 days, for example, the bottoms necessary to carry our supplies to the fleet?

If we have done all those things and have not deceived ourselves with fictitious figures, and have rigidly eliminated speculative possibilities, we have laid the foundation in logistics upon

which our strategy can build; and not until then have we created the possibility of the successful employment of our forces.

We must not forget that a modern fleet is a projectile of relatively short range, and its range does not increase with its size; in fact, the larger the fleet the greater become the difficulties of increasing its range, because of the limitations that logistics is likely to impose.

We are too prone to consider that the size of our fleet in battleships alone is a measure of our national strength. That is true only in part and, like all half-truths, has lurking within it a seed of danger.

A fleet of battleships is powerful only when its constant mobility is assured, when we are able to guarantee the free and unrestricted movement of that fleet to a given theater of war, and within that area after it has arrived.

Armies have been known to starve and fight and march on, and the tide of battle has often turned upon an effort that seemed to be and perhaps was superhuman; but fleets must not be starved, lest they fail to fulfil any function and become derelict.

Material is soulless; it cannot be pushed to an endurance beyond that which the mind of man designs for it.

These seem like trite statements, but the question is: Do we realize the truth in them with sufficient force so that we are prepared to say that the *being able to* is harmonized with the *wishing;* and that here are the facts and figures that show that, in an oversea expedition involving a movement of our total strength, our fleet will never starve?

(d) The Necessity of Considering Quality as Well as Quantity in Supply, and the Limitations Thereby Imposed on Logistics.

Besides quantity in logistics, an important factor enters into the calculation when we appreciate the bearing that quality has upon the scheme of supply.

In regard to quantity, the only safe rule to follow is to provide for more than enough, to insure against losses that will be inevitable, due to delays, to enemy movements, or to any of the manifold causes that will lead to interruptions in the line of supplies.

In regard to quality, we cannot give too careful attention to

the matter of fuel-supply when a fleet is operating at a great distance from a base, and without recourse to docks, and machine shops, to make good the ravages of storms, of accidents, or of conflict with the enemy.

Under such circumstances the efficiency and mobility of the fleet cannot be kept up without making provision for the supply to it of the best grade of steaming fuel and lubricating oils. The sources from which we can draw become correspondingly restricted; for, in respect to fuel, the markets of the world are no longer sources of supply.

The areas of production of good steaming coal, for example, are very restricted; and while depots may and do exist all over the world where such coal is kept on hand, the supply is in limited quantities in any one of them, and is usually covered by a government contract that will not permit of its release to an outside purchaser.

To make provision for anything else than the best grade of fuel is to discount the efficiency of the fleet at the very start. To use fuel other than the highest grade for steaming is to hasten deterioration of material, to lose speed, to overwork the personnel; and the combination of these results is a reduction of efficiency that tends to nullify all our training for success in battle and to pave the way for disaster.

Here enters into the calculation, therefore, a vastly different proposition in logistics than we would have if we had the coal fields of the world to draw upon.

(e) THE INFLUENCE OF LOGISTICS UPON THE TYPE OF WAR TO BE WAGED.

Now let us see from another standpoint the influence of logistics upon the conduct of war.

It may be said without fear of contradiction that logistics has a powerful, if not absolutely a controlling, influence upon the *type* of war a nation is able to wage. Whether a nation can assume the offensive in war or be forced to act upon a pure defensive will be determined by the conclusion whether or not the logistics of the campaign will support an offensive movement.

What will be the nature of our possible wars? What conditions have we already been bound to by our national policies?

Is the Monroe Doctrine, if ever assailed, to be supported by a defensive policy in war?

Surely we are on the defensive so far as the maintenance of that policy is concerned, but, should the issue become one of war, will a pure defensive support it? That is inconceivable.

What obligations have we assumed by our support and advocacy of the open-door policy in the Far East? When that policy is openly assailed, as it is conceivable that it may some day be, or when in effect its principle is violated and strained relations ensue between us and another power, is the issue to be met by our acting on the defensive?

Is the security of our outlying possessions guaranteed by moral force in the event of war? All of these things are inconceivable.

What then will be the result to us of a purely defensive attitude but national humiliation and loss of national character, the combination of which is the precursor to disintegration and national ruin?

This we will never admit to be our destiny, and our security from it will lie in our ability to assume the offensive at the outbreak of hostilities.

This offensive may lead us far afield; and we will find that logistics has so strong a bearing upon our offensive plans of campaign as to determine whether or not they may be undertaken.

In short, it would seem that logistics would almost determine whether we must suffer national humiliation, or conserve our national honor and integrity.

(f) THE IMPORTANCE OF SOLUTIONS OF LOGISTIC PROBLEMS IN TIME OF PEACE.

We should not forget that the most artful strategic conception, supported by valor and courage of the highest order, and the highest development of fitness to win, when once battle is joined, but unsupported by a complete and absolutely true solution of the logistic problems involved, is only a phantom that lures to disaster and ruin. With that fact established, we cannot but comprehend the vast importance to us of a thorough study and understanding of this function of war, and the necessity for timely preparation therefor.

Hamley says in his "Operations of War," when dealing with the subject of logistics and its attendant difficulties in war:

> To see and provide for such circumstances imparts vigor and unity of action to a campaign; not to see and provide for them is to carry on war by compromises and make-shifts, and to end it in disaster.

The French general's statement to his Emperor, Napoleon III, in 1870, that the French army was prepared down to the last soldier's button, is but an example of that self-deception that the unprepared practise upon themselves.

Von der Goltz says in relation to the French project of war in 1870:

> That will always be the fate of projects of war when preparations have not been made in time of peace to harmonize with them, and when the *wishing* and the *being able* are not in concert with each other.

By timely preparation we cannot mean the relegation of this duty to the time when war may be upon us. Much may be done in time of peace; in truth, that which should be done in time of peace will insure rapid and efficient mobilization and concentration, and make possible the pursuit of a campaign along the lines laid down.

Von Moltke's dictum that "errors in the original concentration of an army can seldom be remedied in the course of the subsequent operations" is very important to remember and is as applicable to a fleet as to an army. The only sure way to avoid such errors, and all errors incident to faulty logistics, is to solve all the problems involved beforehand.

(g) How Logistics is Involved with Peace Strategy.

The question of logistics is furthermore intimately involved in one phase of peace strategy—that which is concerned with the development and equipment in time of peace of efficient bases for use in war.

The subject of naval bases is closely allied to the subject of fortresses, about which so much has been written, and the pros and cons of their utility so abundantly set forth in military writings.

Napoleon, writing from Saint Cloud, September 3, 1806, has this to say on the subject (I quote only a short extract from his letter):

> It was asked in the last century if fortifications were of any utility. There are sovereigns who have condemned them, and in consequence have dismantled their strongholds. For myself, I would put the question in another way, and ask if it is possible to make all the combinations required by war without fortified places, and would declare that it is not.
>
> Without fortified depot towns, good plans of campaigns cannot be

formed, and without what I call field places, furnishing shelter against the attacks of hussars and detached bodies, an offensive war cannot be properly carried on.

It is not straining to read into those sentences the words "naval bases" for "fortified depot towns," and "advance bases" for "field places," and appreciate the full applicability of his dictum to present-day necessities.

Hamley, in his "Operations of War," under the head of Fortresses, has this to say:

> At the present time, France, by an elaborate system of fortresses on her frontier, shows her belief in their usefulness. Germany, on the other hand, continues to place her chief reliance on training, organization, numbers, and readiness for war—the attributes which gave her such complete success in 1866 and 1870.
>
> The truth would seem to be that a nation which is *always so strong* and *so ready* as to be able to count on *seizing* and *maintaining* the offensive has little need for fortresses, and is wise to put her strength into her field armies; whereas a country which is *unready* and *requires time to develop* its resources is forced to rely on fortresses, and, provided they are well placed and correctly used, may derive great assistance from them. It does not follow that such a country might not, in the long run, derive greater profit from following Germany's example of strength and readiness.

What does this mean to us, in so far as the situation in the Pacific is concerned? How would the preparation in time of peace of naval bases affect the logistics of a campaign in the Far East? Providence has so guided our destiny in the Pacific that we find ourselves the sole possessors of stepping stones that lead across that ocean. These have been provided us for use and not to be neglected. If we do not make proper use of them, they may be taken from us.

We are not required to take an inch of territory that is the property of any man or any state that owes allegiance to a foreign power. We have simply the task set before us to use wisely and with foresight the instruments that have been placed in our hands.

All of our positions in the Pacific are within easy steaming distance of each other, and nothing more than a casual glance at the chart will be necessary to impress one with the wonderful potentiality that exists in those positions for the strategic control of that ocean.

With the Hawaiian Islands, Guam, Samoa and Kiska properly fortified and stored in time of peace, we shall have reduced the problem of logistics in time of war to its simplest and lowest terms.

We shall have denied their use to an enemy; we shall have made provision for our fleet to pass, without encumbrance of train or impedimenta of any sort, from one position to another in whatever direction the need may be, leaving behind it a secure line of communication; we shall have conserved the mobility of the fleet; and we shall have made it possible to carry on offensive war.

Consider the converse of this and note the hazards and difficulties that hedge about the problem of logistics, and the consequent precariousness attending the task of conducting a war across the sea. We have in this case no supplies, save what the fleet may bring in its train. Any movement of the fleet becomes, therefore, subservient to the accumulation of vessels necessary not only to constitute the train, but to guarantee delivery to the fleet after arrival in the Far East, sufficient to maintain its life. The fleet, without a base to go to in the theater of war, where it can be secure from harassment during periods of necessary refreshment, refueling and repair, is projected deeply into a hostile area with precarious lines of supply; and we have reproduced in naval operations the *mise en scène* that goes with the tragedy of Napoleon's march to and retreat from Moscow.

Consider the necessities of a fleet such as ours, operating far from a base. Simple calculation will show, in respect to one item alone, that 200,000 tons of coal a month will be necessary to maintain the life of that fleet in a theater of war in the Far East.

Without a secure line of communication, which cannot be guaranteed without holding a secure base with strong positions in its rear leading to home territory, is it not apparent that the logistics upon which the success of the whole plan must be based will not support the structure?

Such hazards as these may well be forced upon one during a period of war, and it may be that then we cannot escape them, but is it sane to plan upon such hazards in peace time, when the remedies are so apparent?

Measure the cost of peace time preparation in this respect with the cost of war time demands.

Logistics will supply the figures, and results will show that economics will itself be on the side of foresight.

Measure the results to be anticipated in conducting war under the two conditions. History will supply the data. It is full of such contrasts, and its decision is invariably on the side of foresight in preparation.

Who knows our destiny, or whither uncontrollable and unforeseen events may lead us?

Surely there was, in 1898, a providential enlargement upon our then apparent destiny in the Pacific.

Our mission in the world is Peace with Honor; by moral force if possible, by physical force if necessary.

By properly grasping and faithfully solving the logistic problems of the Pacific, we shall properly link up our outposts in the Pacific with the home country by fortifying, garrisoning, and storing those positions. In doing that we menace the integrity of no foreign power; we shape our present manifest destiny; and we supply that present-day expression of moral force that alone can ensure and guarantee peace.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

STEERING MEN-OF-WAR BY ELECTRICITY.

By ENSIGN W. A. EDWARDS, U. S. Navy.

The U. S. S. *Chester* and the U. S. S. *Des Moines* are the only two ships of our navy which are equipped with the Cutler Hammer system of electric steering. The U. S. S. *Montgomery* has an electric steering installation, but the principles of its construction differ so radically from the above-mentioned gear that no attempt will be made to describe it. Until very recently the U. S. S. *Des Moines* was equipped with steam as an auxiliary means of steering, but at the present time she is depending on the electric gear entirely as is also the *Chester*. This fact, in addition to the successful results obtained from the gear, would seem to indicate that we may reasonably expect to see such installations appear in our future ships, just as we have seen the gradual development of electric turret gear culminate in its present state of perfection.

One undoubtedly has a queer sensation upon taking the deck of a "wheelless" ship for the first time. My first experience with this electric gear occurred four hours after I had joined the ship and while I was standing my first watch on her, and in order that those who follow may not have as startling an introduction as I had, the following remarks are set down. No attempt has been made to enter into the intricate details of the mechanism, on the contrary the work is quite rough and is intended simply to give the uninitiated an idea of what is meant by electric steering gear. It is far from unreasonable to suppose that within a very few years this gear will be as universal as the electric turret gears, which we see on all sides, and that officers of the service, one and all, will have to familiarize themselves with its construction and operation. The features embodied in this gear are so essentially different from the steam steering gear, commonly employed on

naval vessels, and the results produced are of such a satisfactory nature, that aside from all else it merits a little consideration.

This electric gear was installed on the *Des Moines* a little over two years ago, and was put on the *Chester* at the Boston Navy Yard during the months of February and March of 1912. The two other sets, which were purchased with the intention of installing them on the *Salem* and the *Birmingham*, have not been put in as yet, owing to the fact that the opportunity has not presented itself. It is understood, however, that other, and similar, installations are now being installed. Having joined the *Chester* a short time after her installation was completed, the writer has been, therefore, shipmate with this gear practically since its installation, and has had full opportunity to observe its operation and the general results obtained therefrom. Serving on the *Des Moines* at the present time, with the same gear, has given me further chance to observe the results obtained and the general behavior of the gear. Before taking up a description of the gear as installed, and of the general results produced, a brief history of the conditions which led up to the installation of this gear on the *Chester*, as the sole means of steering by power, may possibly be of interest.

Several years ago the Navy Department became interested in the question of steering its ships by electricity, owing to the possibilities which such an equipment presented of a reduction in weights and space, of the elimination of heat and moisture from the after part of the vessel, of the doing away with the tiller ropes or other mechanical means of operating the steering gear from the bridge, and of the saving of steam which such an installation would effect. This question remained under discussion for a number of years, until about 1909, when a contract was let for supplying an electric steering gear for the *Des Moines* as an auxiliary to the steam engine outfit. I am under the impression that the question of electric steering is an old one; just how old, however, I cannot say. This contract was placed with the Cutler Hammer Mfg. Co., of Milwaukee, Wis., who advocated the use of an electric motor taking its power directly from the dynamo mains and operated by a powerful automatic controller, thus eliminating the necessity of a motor generator outfit. This contract required the control of the motor to be similar to that of the steam engine; that is, the follow-up system had

to be employed (requiring the rudder to move to and to stop at any angle at which the wheel may be placed); and to accomplish this result a small follow-up drum controller was provided in the steering engine room, which was operated by the ship's tiller ropes from the wheel on the bridge.

The preliminary trials of the arrangement of the gear were quite satisfactory. Such changes, however, were made as to install a small reversing switch stand for the electrical control of the gear from the bridge, without the follow-up system, but which would eliminate the necessity for tiller ropes or telemotor connections and utilize only four small wires between the steering engine room and the steering stand on the bridge. It seems that the use of the steam gear, as well as the use of the follow-up control of the electric gear, was thereafter abandoned on the *Des Moines,* and that steering by the non-follow-up electric system became the fashion.

Although the reports from the *Des Moines* were of a satisfactory and pleasing nature, the Navy Department was still naturally doubtful about the use of such electric steering-gear equipments, especially as regards the elimination of the follow-up principle, which long usage had led the service to believe was essential to the satisfactory control of the rudder. It was decided, however, to install such an installation as this on the *Chester,* to be operated only by the non-follow-up system, and to remove the steam gear entirely, in order that confirming opinions might be obtained as to the practicability of abandoning the time-honored follow-up control and of steering naval vessels by electricity. Contract was therefore placed with the American Engineering Co., of Philadelphia, representing the Cutler Hammer Co., designers and manufacturers of this gear, for the *Chester's* equipment, and as stated above the installation was completed the early part of 1912, about two and one-half years after the first installation had been made on the *Des Moines.*

As soon as the vessel was ready to put to sea after the installation had been completed, she was ordered to meet the *Carpathia* at the time of the *Titanic* disaster, and was engaged in this mission about a week during the initial trial of the electric gear, upon which she had to rely entirely for steering from the bridge. Shortly after the completion of this duty, she was ordered to the ice-fields to report the presence of ice-bergs, and was engaged in

this work for several weeks. Up to the time, therefore, that the *Chester* was recently placed in reserve at the Philadelphia yard, she was in practically continuous service from the time the gear was put in, which service was of such a nature as to severely test the operation and reliability of the gear.

The result of all these trials showed this steering-gear device to be satisfactory, and an improvement on the old steam gear as regards accuracy of steering and the ease of operation for the helmsman, and as regards vibration of the ship, and the reduction of heat and moisture in that part of the ship adjacent to the steering-gear compartments. An appreciable saving in the total steam consumption was also noticeable. It is surprising to note with what accuracy and with what small motion of the ship it is possible to steer, the response to the movement of the master switch stand being very rapid, and the helmsman consequently being able to keep the ship on her course with small helm angles and with no effort whatsoever. It is my opinion that the master switch or non-follow-up control is an entirely practical and suitable arrangement and the helmsmen all preferred this control, with its easy operation and with the quick response of the rudder, to the old wheel control.

It is, of course, the most natural thing in the world for an old hand to throw his wheel to port upon receiving an order to "starboard your helm." We may not always have these old hands with us, however, and one of the natural advantages of this type of gear is that, to starboard the helm, all one has to do is to throw the lever to starboard and watch the helm indicator—the most logical thing in the world.

An analysis of the conditions and of the electrical apparatus supplied indicated clearly that these results would naturally follow, as compared with the steam steering-gear equipment. A cut is shown of the electric steering stand as installed on the bridge; and as its operating lever has only to rotate a small cylinder, containing several contact segments, its ease of operation to the helmsman is at once apparent. The pressure of the thumb and forefinger is quite sufficient to give the ship hard over helm at full speed. From this steering stand small electric wires lead directly to the main controller in the steering engine room, and therefore no lost motion of mechanical parts is involved as in the case of the ordinary tiller rope or telemotor control. This absence of lost motion and the natural rapidity with which elec-

trical apparatus can be operated make the response of the rudder to the movement of the steering stand practically instantaneous. The motor driving the rudder is provided with special winding to give variable speed and torque characteristics, so that the movement of the rudder over the center angles, where the load is light, is exceedingly rapid. These angles are the angles which

THE ELECTRIC STEERING STAND.

are usually made use of in steering a ship. From exhaustive tests of the gear on the *Chester*, it has been found that the time required to put the helm from hard over to hard over is about twenty seconds at speeds varying from six to eighteen knots. The speed with which the rudder is operated over the small central angles, which may be considered as cruising helm angles, is not in direct proportion to this time interval, however, owing to the fact that

the electric gear starts immediately and its speed is governed to a great extent by the load produced by the rudder. Hence, in estimating twenty seconds as an interval from hard over to hard over, the actual rapidity of movement over the smaller angles is not brought out. Whether or not the response obtained from the electric gear is more rapid than that obtained from the steam gear, I cannot say definitely, but I rather imagine that it is. At any rate it is more uniform than that of the steam gear.

With the steam engine gear, even when the rudder is standing still, some steam is always passing through the engine valves, causing a waste of steam in addition to that consumed in the operation of the engine which is, to say the least, of low efficiency. Again, the loss occasioned in the condensation throughout a long lead of steam pipe, and the loss due to the steam traps, as well as to leaky valves, etc., are eliminated with this electric gear. In comparing the size of the hole through a water-tight bulkhead which is necessary for a steam lead with that which is necessary for a small electric wire lead, the steam gear must suffer. Again, owing to their small size, several auxiliary electric leads could be run to the bridge, whereas it is obviously out of the question to think of running several auxiliary steam pipes. Beyond a doubt such steam conditions produce a large degree of heat and moisture in the after part of the ship, and the pipes certainly offer more of a target to the enemy's fire than do a few small electric wires. That there is less chance of a rupture to the electric wiring than there is to the steam line is apparent. Even should such rupture occur with the electric wiring it could be repaired much quicker than could the steam line. From the standpoint of safety to the personnel, it would seem as though the electric connections offer less chances for casualties than does the steam line. To illustrate more clearly the point which I wish to bring out, it is perfectly possible and feasible to run the electric connections from the bridge to the steering engine room down the armored tube and through the double bottoms. This, however, is a side issue and a deviation from the topic in hand.

The electric gear is so arranged that the motor is started and stopped each time the rudder is started and stopped, and the current is entirely cut off when the rudder is at rest. Although a small amount of heat is generated in the rheostat controlling the motor, it is quite insignificant as compared with the heat from the

steam engine, and is not sufficient to cause the least annoyance in these compartments. The wardroom of the *Des Moines* is located not more than twenty feet from the steering engine room, yet no inconvenience from the heat therein has ever been experienced, even in the tropics.

Taking a few figures to prove this, we find that, with the temperature at 82° F. in the shade on the bridge, that of the steering engine room was 98° F. Again, with 78° F. on the bridge, the steering engine room showed 92° F. Considering that these figures represent a contrast between the bridge and the steering engine room, and that the temperatures inside the ship must of necessity be considerably higher than those on the bridge, it is evident that the temperatures in the steering engine room are not excessive, to say the least. By far the most convincing argument, however, is the statement of a quartermaster that "in the old days when we had steam steering on here, we could dry clothes in the steering engine room in twenty minutes, but now that place is no good for drying clothes."

Again, the electric motor having a perfectly balanced armature, the vibration in this part of the ship is naturally much less than with the steam engine with reciprocating parts.

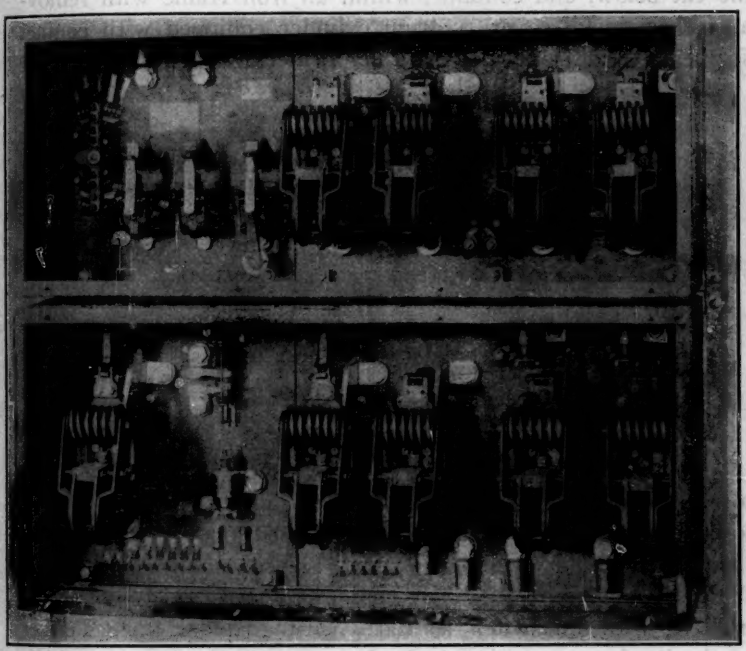
The electric installation on the *Chester* (and with a few minor differences, that of the *Des Moines* is exactly the same) includes the electric motor with disc brake, installed in what was formerly the steering engine room compartment, the main automatic controller and resistances just forward of the motor, and in the compartment where the hand gear is located, a limit switch installed in the screw gear room, and three master controllers or steering stands, one on the bridge, one in the chart house and one in the "motor room." On the *Des Moines* this third stand is located on the quarterdeck. Within the steering stand is a reversing switch for governing the main automatic controller in the "motor room." This reversing switch is operated by the lever shown in the cut, and closes the circuit through several contact fingers. A latching device retains the lever in the center or off position, and pressure of the hand on top of the lever releases the latch, while a centering spring acts to return the lever to the off position. Also, should the hand be removed from the lever in any running position, it will immediately restore itself to the off position, when the motor will be instantly stopped.

The stand is so arranged that a small movement of the lever causes the motor to start and run at a slow speed. A further and relatively large angular movement causes the motor to accelerate at once to full speed. Throwing the lever in the reverse direction reverses the rudder motor, so that it is simply necessary to throw the lever to starboard or to port according to the direction in which it is desired to move the ship. About 60 degrees' movement of the operating lever in either direction gives full control, including starting, stopping, slow and fast speeds and reversing. This feature commends itself, especially where quick work at the helm is necessary.

All of the metal parts of the steering stand are of brass, and no magnetic interferences from changing loads were occasioned by installing the stands near the compass. It seems hardly probable that the small currents adjacent to the compass could have any effect thereupon, specially protected, as they are, in brass coverings, with no exposed or bare parts. As no follow-up control is here involved, the rudder will keep on moving as long as the operating lever is held in a running position, and is stopped at any angle by returning the operating lever to the off position. In case of a casualty to the helmsman in time of action, this fact would undoubtedly prove to be an advantageous one. Should the rudder for any reason keep on moving, the limit switch, which is provided to prevent the jamming of the gear at the hard-over position, will function. With this type of control the position of the rudder is at any instant determined by reference to the helm angle indicator, located adjacent to the steering stands.

The general arrangement of the main control panel is shown in the cut on page 83, the front cover, with which the enclosing cases are provided, having been removed, for purpose of illustration, when the photograph was taken. This cut shows the controllers to consist of a switchboard upon which are mounted a number of electrically operated switches, which commute the connections to the main motor and govern each of its operations, which includes starting, stopping, accelerating and slowing down. In addition an overload device is provided which, in the case of extreme overloads, automatically limits the current on the motor to a safe value, and by its use the necessity for circuit breakers and fuses is obviated. The electrically operated switches not only provide a very effective means of commuting the main motor circuits, but they

obviously do away with the necessity of running heavy control circuits throughout the ship to the steering stations. The current required to operate the electrical switches is but a fraction of an ampere, and for this reason can be carried on a wire of very small cross-section. Therefore, the contacts for the limit switch and the master controllers need only be rugged enough to handle these small currents.



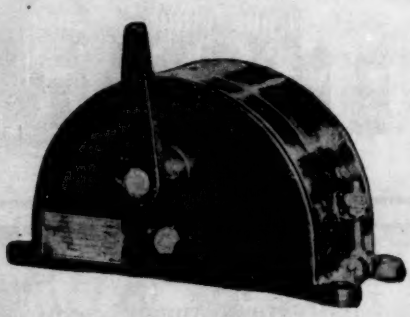
MAIN CONTROL PANEL.

All of the contactors are provided with heavy laminated contacts and also with arc-rupturing, easily renewable auxiliary contacts; the switches are also provided with powerful magnetic blowouts. These switches are of very rugged construction and seem to be easily capable of standing the repeated operations required of the steering gear. The resistances used in connection with the controller, which are installed against the side of the vessel at the rear of the panel, are of the Cast Iron Grid type and are especially designed for heavy duty. As mentioned above, the

heat generated is indeed slight as compared with that from the steam engine.

In the upper left-hand corner of the photograph of the main contactor panel is seen a selective switch, by means of which the control can be delegated to any one of the three steering stands, and which also makes it impossible to steer from more than one station at a time.

The limit switch installed in the screw gear room is shown in the cut below, and contains, within an iron frame with removable sheet metal cover, a drum cylinder equipped with contact segments, and is provided with a centering spring device for

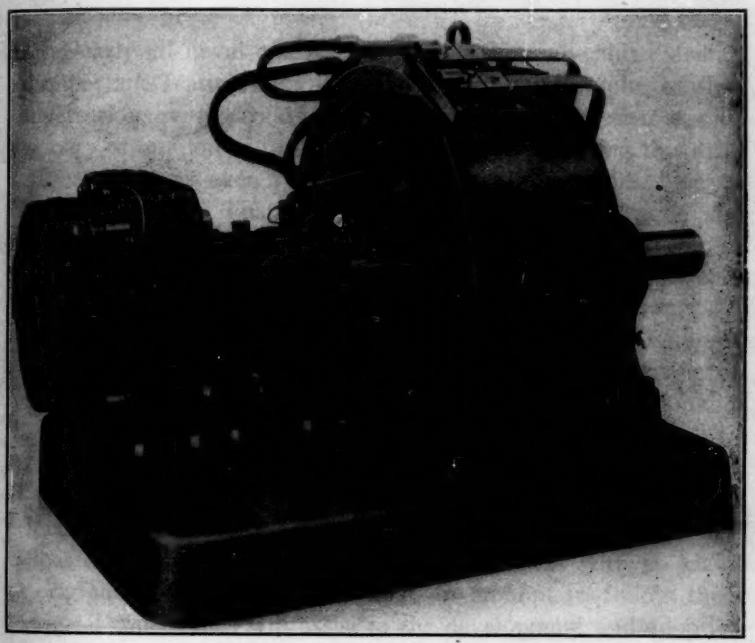


LIMIT SWITCH.

bringing the cylinder to the central position. The lever fastened to the drum shaft is arranged to be operated by dogs connected to the traveling nuts of the screw gear. The secondary circuits from the control station to the main contactor controller are connected in series with this switch, so that when the rudder reaches either of the hard-over positions one of the circuits is opened and the motor stopped. The connections are then such that the rudder can be brought back in the reverse direction by movement of the steering stand lever in that direction. When the rudder moves away from the extreme limit position, the switch is restored to its normal position automatically by the centering spring.

The combined motor and disc brake is shown in the cut on page 85, and is of the make of the Diehl Mfg. Co. It is 75 H. P., 250 R. P. M., at 120 volts. The motor was especially designed, with sufficient capacity to operate the rudder under severe conditions, and is also provided with a heavy overload capacity, to take

care of the extreme conditions when the rudder is put hard over with the vessel going at full speed ahead. The windings of the motor, 50% series and 50% shunt, giving variable speed and torque characteristics, take advantage of the variation in load from the center to the hard-over positions, giving a quick response to the rudder, especially in the central angles, and also permitting the installation of an equipment of smaller rated horse-power than would otherwise be required.



STEERING GEAR MOTOR.

It is quite evident that no attempt has been made to enter into the minute details of this gear. Instead, a general description has been given, or an introduction, so to speak, for the benefit of those younger officers of the service who are not familiar with such methods of steering. From the intimate relations which I have had with this method of steering, from the most excellent results which I have seen produced, and from the numerous advantages which it seems to possess over any other method in

use to-day, I cannot help but feel that the electric steering gear is up-to-date, and furthermore that it has come to stay.

In summation of the above remarks, I would say that at the time of the present writing, Nov. 15, 1912, the *Des Moines* has covered 3600 miles in continuous service, most of which was done in the tropics, during which time the electric steering gear was used constantly without a single breakdown of any kind.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SUB-CALIBER DRILL.

By LIEUTENANT C. C. GILL, U. S. Navy.

1. Nearly all naval officers are agreed that sub-caliber drill is an important feature of gunnery training; but in spite of this, conversations with various officers show that there exists a wide diversity of opinion as to the best method of conducting this drill, and in some cases even a confusion of thought as to the object to be accomplished. That junior officers should have vague and indefinite ideas about gunnery training is not at all surprising, in view of the bewildering way in which this topic is treated in conversation, in reports, and even in published articles.

2. It is with great hesitancy that I enter upon a discussion of this subject, because I appreciate the difficulty of dogmatizing on questions respecting which officers differ so widely in opinion. But I believe that our gunnery, although good, falls far short of the excellence it should attain, and that a potent reason for this is a lack of system and method in our manner of training. This criticism is particularly true of our manner of conducting sub-caliber drill, and I therefore present these ideas with no claim to originality, but with a hope that an attempt to follow them to logical conclusions will assist in the development and adoption of a systematic plan for conducting this drill.

3. A cogent reason for the adoption of a definite plan is that it will result in economy of time. That this economy of time is of great importance, is shown by the complaint prevalent throughout the fleet, that there is not sufficient time available to devote to preparation for target practice. It is a regrettable fact that there is much justice in this complaint; but in view of the great number of things which the fleet has to do, the trouble is difficult, if not impossible, to correct. For this reason comparatively little sub-caliber drill has been held during the past year. How-

ever, in spite of the paucity of time, it is logical to believe that the adoption of a well thought out plan, perfected and followed by all ships, will result in more drill, because all ships will then be better prepared to take advantage of every opportunity that presents itself. Moreover, greater interest will be taken in the drill, both because of this economy of time and because a well defined plan will result in a clearer understanding of the drill.

4. In the first place, it might be well to make clear just what is meant by the term sub-caliber drill. Sub-caliber drill may be defined as a device for gunnery training by which a gun of comparatively small caliber is so attached to a big gun that the small or sub-caliber gun is pointed, fired, and the fire controlled, by operating the same mechanical appliances, and performing the same duties required to point, fire, and control the fire of the big gun. The members of the crew of the big gun are thus trained in their regular duties, except that the firing mechanism is so connected that when the firing key is pressed it operates to fire the sub-caliber gun instead of the big gun. In this way sub-caliber drill affords a manner of training by which the firing of the big gun, with all the attending problems of fire control, is simulated to a very profitable degree without the expenditure of big gun powder and shell, and without subjecting the big gun to the wear and tear of actual firing. It is evident that the greater the range and the accuracy of the sub-caliber gun used, the greater will be the benefit of the drill, but for reasons of expediency the department has adopted the 1-pounder for use with the 12-inch gun, and therefore this specific arrangement will be considered for convenience in this discussion, although whatever may be the size of the sub-caliber the principles of the training remain the same.

5. In order not to get adrift from the main issue of this discussion, it will be necessary to accept the opinion of the Target Practice Office as expert on general questions respecting proper battle training. Confusion of ideas may thus be prevented by admitting the point that, as it is theoretically true, so is it reasonable to believe that training with sub-caliber exactly along the lines prescribed for target practice will produce the very best results. It follows that improvement in the rules and instructions for target practice will result in a corresponding improvement in the plan for conducting sub-caliber drill.

6. The groundwork of gunnery training consists of stationing the men in the gun crews and fire control part, and drilling them in their individual duties. The selection of pointers is perhaps the most difficult part of this groundwork, but it can be satisfactorily accomplished by means of the mechanical contrivances known as the Morris Tube, the dotter and the check sight. After this initial stage of preliminary training has been completed, the preparation of a division of ships for battle may be conveniently divided into three distinct steps: first, developing team work with a gun or a turret acting singly; second, developing team work with a ship acting singly; third, developing team work with a division of ships acting singly. (Gunnery training may be considered as completed with the division, as the grouping of divisions into fleets is more a question of tactics than one of gunnery.)

7. Inasmuch as the general scheme for target practice recognizes these steps by prescribing different kinds of practices and supplying a separate allowance of ammunition for each, so in like manner should the plan for conducting sub-caliber drill recognize these same distinct steps. Therefore, the following proposed plan begins with the kind of sub-caliber drill to be held in accomplishing the first step in the preparation of a division of ships for battle, namely, to develop team work with a gun or a turret acting singly. The other two steps will also be discussed separately and in turn.

METHOD OF CONDUCTING SUB-CALIBER DRILL TO DEVELOP TEAM WORK WITH A GUN OR TURRET ACTING SINGLY.

1. In this method economy in time and development of team work require that, in so far as it is practicable, the entire system, consisting of the gun crews, range finder party, spotters, fire control party, and ship control party, be exercised at the same time. Perhaps the most important feature in this method is the training afforded the gun pointer group, but in laying particular stress upon this point, care should be taken not to overlook the necessity of affording, at the same time, training for the men who occupy less conspicuous stations, but who have, nevertheless, difficult and important duties to perform in the complicated system by which hitting efficiency is attained.

2. To assure fairness, for reasons of competition, and in order that weight may be given to the scores in qualifying gun pointers for extra pay, all gun pointers should fire under approximately the same conditions, and official report should be made of the drill, whenever this method is carried out. To accomplish this end, conditions similar to the following should be prescribed:

(a) Firing to commence when the target is 27° forward of the beam and to cease when the target bears 27° abaft the beam.

(b) The distance of the target when abeam to be not less than 1000 yards.

(c) A difference of three knots to be maintained between the speed of the firing ship and the speed of the target.

(d) The scores to be computed in accordance with the rules for elementary target practice for the current year, and a load to be simulated for each shot fired consuming an interval of time equal to the average loading interval for that particular gun as computed by the ordnance officer of the ship.

(e) The screens to be of a prescribed size (20′ x 15′ if practicable).

(f) Only one or two turrets to fire at a time, and the number of screens and color of shells to be so arranged that the score of each pointer may be determined.

NOTE.—It is important that both sub-caliber guns of a turret be so bore-sighted and calibrated that the shells will fall as nearly together as practicable at the range at which the drill is held.

3. The arguments against attempting to fulfill these conditions, because of the time consumed and trouble involved, are admitted, but, nevertheless, it is believed that with skilful management this exercise can be carried out in smooth water expeditiously and to a very good advantage. The details of fulfilling the prescribed conditions should be left to the discretion of commanding officers. In this connection attention is called to the smart work done by the repair parties during the recent elementary target practice. In some instances the four screens were shifted in less than 15 minutes after the firing vessel had finished her run. It would appear that at shorter range with lighter material and slower speeds, screens could be shifted with even less delay and difficulty than was the case during the elementary practice.

4. It is suggested that a ship acting singly could probably carry out this drill advantageously by having the target anchored,

or towed by a steam launch. After each run the repair party in the steam launch could count the hits and either paint out the holes or shift the screens. Time might be saved by having the firing vessel steam between two targets, firing at both simultaneously. When firing at towed targets the danger of ricochets to the right must always be guarded against.

5. Another plan suggested for carrying out this method is to have two ships working together, each towing one or two rafts similar to the experimental raft designed by Lieutenant-Commander A. M. Proctor. Both ships to fire at the same time, regulating their speeds to give the desired rate of change in range and deflection, and alternating in taking the superior speed. Repair boats could probably be handled to advantage by having them towed from the lower booms. At the completion of the run both ships to stop, paint out holes or shift screens and then proceed on another run. The towing ship to count the hits after each run and signal the number of each color on each screen to the firing vessel.

6. The benefits resulting from this drill are:

(a) That it creates interest and incites competition among pointers, turrets and ships. (It might be a good plan for each ship to offer a small money prize from the ship's Welfare fund for the turret or gun which makes the best score on each day that this exercise is held.)

(b) That it affords a means of obtaining an efficiency report of pointers, which may be given weight in qualifying pointers for extra pay.

(c) That it is a training for the range finder party.

(d) That it is a valuable training for sight-setters, and impresses upon the minds of sight-setters and pointers the importance of having the sights set promptly and correctly. For obvious reasons, training for sight-setters is a very important factor in preparing for battle, and it is therefore desirable, during this drill, to regulate the speed of the firing vessels so as to require as much sight-setting as practicable, without introducing uncertainties in range and deflection to handicap the pointers.

(e) That it is a training for spotters, especially in their duties for elementary practice, and should make clear the advantages of placing reliance on the range finder; at the same time emphasizing the fact that while a little spotting may be most necessary, still

too much spotting may be most harmful. The spotter should take station near to, or within easy communication, of the range finder, and spot much the same as he would in elementary practice.

NOTE.—In order that spotters may be benefited by sub-caliber drill, it is important that its limitations should be appreciated. It is true that a 1-pounder shell fired at a range of 1000 yards and falling 300 yards short, does not look the same to the spotter as would a 12-inch shell fired at a range of 10,000 yards and falling 300 yards short; therefore it is reasonable to suppose that sub-caliber drill is of no particular benefit to the spotter in training him to estimate the *amount* of the corrections to be applied when firing at battle ranges. However, it must be remembered that the estimating of the *amount* of the corrections to be applied is only a part of a spotter's duties, and though it is an important part, still it is my belief that it has been emphasized to such an extent that the other equally important, and perhaps more difficult duties of the spotter have been neglected. It appears to me that sub-caliber exercise may be made useful in training those faculties which are used by the spotter in performing these other duties. Moreover, some benefit in training the spotters to estimate *amounts* over or short may result by stationing them in such a low position that the 1-pounder splash will appear to them, relative to the sub-caliber target, just as the splash of a 12-inch shell would appear, relative to the actual target, when fired at battle range and viewed from the spotting top.

METHOD OF CONDUCTING SUB-CALIBER DRILL TO DEVELOP TEAM WORK WITH A SHIP ACTING SINGLY.

1. It is believed that a valuable training would result if this method were frequently combined with general quarters drill and carried out with battle stations manned and all hands performing their respective duties exactly as would obtain during actual battle.

2. It is suggested that when held as a dress rehearsal for individual ship battle practice, it would be well to carry out the rules and instructions for target practice in making the approach and in firing, with the following exceptions:

(a) The range to be reduced to approximately the range at which the angle of fall of the 1-pounder is the same as the angle of fall of the 12-inch when fired at the battle range.

(b) The speed of the firing vessel to be reduced by the amount which will make the run over the reduced range consume an interval of time equal to that consumed in making the run at the prescribed battle speed over the prescribed battle range.

(c) The target screen to be similar to the battle practice screen, but reduced in size corresponding to the reduction in range.

3. The desirability of having this drill frequently as a means of assuring preparedness for battle, necessitates a modification by which the approach is omitted and one requiring as little time and trouble as possible to carry out. It is believed that this modification could be conveniently used by vessels cruising in company by forming two columns at an interval equal to the prescribed range; each ship to put over a sub-caliber target and all ships to fire at the same time, the desired rate of change in range and deflection being produced by first one column steaming a little faster than the other and then vice versa.

4. A further modification is suggested by which sub-caliber rifles are fired instead of sub-caliber 1-pounders. This modification may be carried out when holding rehearsals at the prescribed battle range at battle speed, and at such other times as it may be necessary to economize in 1-pounder ammunition.

METHOD OF CONDUCTING SUB-CALIBER DRILL TO DEVELOP TEAM WORK WITH A DIVISION OF SHIPS ACTING SINGLY.

1. When using this method as a dress rehearsal for division battle practice, it would seem advisable to steam at battle speed and fire at battle range, following, without exception, the rules and instructions for Division Target Practice.

2. The point of gunnery training in this step not covered by the two preceding steps is the training afforded the fire control parties in working together under the direction of the Division Commander. The new problems introduced are those of concentration of gun fire and of interference of gun fire between ships.

3. It is evident that, because of the long range, the 1-pounder shells will fall nearer the firing vessels than the target; but the spotters and fire control parties may be trained by having them move the bunched splashes of their respective 1-pounders from one place to another in obedience to orders to shift the point of aim from one target to another.

4. It is believed that a modification of this method, using either sub-caliber 1-pounders or sub-caliber rifles, could be advantageously carried out during the simulated battle contacts which take place in fleet maneuvers and exercises.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE PANAMA CANAL IN INTERNATIONAL LAW.[1]

By CAPTAIN H. S. KNAPP, U. S. Navy.

The Hay-Pauncefote treaty,[2] negotiated in 1901 between the United States and Great Britain, is the basis of the international status of the Panama Canal. It superseded the Clayton-Bulwer treaty[3] of 1850 between the same nations. In another place[4] the writer has made a study of the two treaties, and a summary of the conclusions reached will be given here, for it is important to have a knowledge of the antecedent history to appreciate the full bearings of the present treaty obligations of the United States with respect to the canal.

Long before 1850 the desirability and eventual necessity of a canal joining the Atlantic and the Pacific had been recognized, but no sentiment had developed in the United States for exclusive control by this nation. On the contrary, the utterances of representative men were quite in the opposite sense; *i. e.*, toward a guarantee by all the great commercial nations that the canal should be free and open to all. Shortly before 1850 Great Britain, already having a foothold in Central America at Belize, assumed a protectorate over the Mosquito Indian country, claiming as far south as the San Juan River. This greatly irritated the people of the United States, for, in addition to being an infringement upon

[1] For convenience of reference for members desiring other points in connection with the Panama Canal the following articles are mentioned: In PROCEEDINGS, No. 142, June, 1912, Panama Canal Tolls, by Rear-Admiral C. H. Stockton; and in PROCEEDINGS, No. 133, March, 1910, The Real Status of the Panama Canal as Regards Neutralization, by Captain H. S. Knapp, U. S. N.

[2] Compilation of Treaties in Force, 1904, p. 609.

[3] Compilation of Treaties in Force, 1904, p. 380.

[4] The Real Status of the Panama Canal as Regards Neutralization. U. S. NAVAL INSTITUTE PROCEEDINGS, Vol. 36, No. 1; Whole No. 133, March, 1910.

the Monroe Doctrine, it would, if allowed, put Great Britain in control of the eastern end of what was then considered to be the most practicable route for a canal. The attitude of the two nations was one of mutual jealousy, each fearing that the other would attempt to get for itself some advantage with respect to a canal not possessed by the other, though neither actually sought a monopoly of political control. In other words, it was not a question of what either nation did want to get for itself alone, but of what each suspected that the other nation might be trying to get for itself alone.

The Clayton-Bulwer treaty of 1850 settled that point, the first sentence of Article I reading: "The Governments of the United States and Great Britain hereby declare that neither the one nor the other will ever obtain or maintain for itself any exclusive control over the said ship-canal." Other stipulations were that neither would erect or maintain fortifications commanding, or in the vicinity of the canal; nor occupy, fortify, colonize, assume or exercise any dominion over Nicaragua, Costa Rica, the Mosquito Coast, or any part of Central America, nor to that end make use of any intimacy or alliance; the powers jointly engaged to protect the finished canal from interruption, seizure or unjust confiscation, and to guarantee that the canal should be ever open and free; they engaged to invite other powers to join them in similar stipulations; and they established a "general rule" by agreeing to extend their protection, not alone to a canal at Nicaragua (the then favored site), but to any other practicable communication, whether by canal or railway, across the Isthmus.

In a memorandum[5] of the Secretary of State, Mr. Olney, written in 1896, it is pointed out that the United States desired, in negotiating the Clayton-Bulwer treaty, to overcome two difficulties: one, the rights asserted by Great Britain on the Mosquito Coast; the other, the inability to get in this country the capital necessary to prosecute the work of canal construction by the American company, in whose favor the United States had obtained concessions from Nicaragua by treaty in 1849, or to get capital abroad as long as the canal enterprise was conducted under purely American auspices. After stating that the treaty secured the two objects desired, he goes on to say: "In short, the true

[5] Moore's International Law Digest, Vol. III, Sec. 364.

operation and effect of the Clayton-Bulwer treaty is that, as respects Central America generally, Great Britain has expressly bound herself to the Monroe Doctrine, while, as respects all water and land interoceanic communications across the Isthmus, the United States has expressly bound itself to so far waive the Monroe Doctrine as to admit Great Britain to a joint protectorate." The waiver of the Monroe Doctrine was even greater than Mr. Olney states, for Article VI opens with the words: "The contracting parties in this convention engage to invite every state, with which both or either have friendly intercourse, to enter into stipulations with them similar to those which they have entered into with each other." If it was a waiver of the Monroe Doctrine in any degree to enter into a joint protectorate of the canal with Great Britain, it was certainly a waiver to a greater degree to engage to invite every other state to do likewise.

For a decade after 1850 there was friction between the United States and Great Britain over the interpretation of some features of the Clayton-Bulwer treaty, which were not directly connected, however, with canal matters. In 1860 these sources of friction were satisfactorily adjusted, and then the Civil War engaged this country's attention to the exclusion of everything not of immediate importance. After the Civil War there were signs of a change of sentiment in the United States regarding the control of the canal. It began to be appreciated that our interests demanded our exclusive control of the canal, instead of sharing that control with foreign nations, or with one such nation, as Great Britain. Such a complete reversal of sentiment took time to develop. In 1877, in President Grant's administration, a draft treaty looking to neutralization was prepared "to which it was proposed to obtain the accession of the principal maritime powers."[6] In his message of March 8, 1880, President Hayes enunciated the new and contrary policy in these plain words: "The policy of this country is a canal under American control. The United States cannot consent to the surrender of this control to any European power, or to any combination of European powers"[7]; and further on he used the words so often quoted since: "It (the canal) will be . . . . virtually a part of the coast line of the United States." This policy directly contravened our engagements with Great

[6] Moore's International Law Digest, Vol. III, p. 187.
[7] Moore's International Law Digest, Vol. III, p. 188.

Britain in the Clayton-Bulwer treaty, and it became our object to get rid of those engagements in order to have the free hand we desired. For twenty years the matter was agitated until, in the Hay-Pauncefote treaty, our wishes were met by Great Britain, and very fully met as will be seen by a perusal of the treaty which is quoted at the end of this paper.

This treaty, as stated at the outset, is the basis of the international status of the canal. With a knowledge of the conditions before the treaty was negotiated it is difficult to see in what manner the United States has been worsted in its provisions, as has recently been claimed. Almost invariably treaties are compromises, and almost invariably for favors granted there is, expressed or implied, a *quid pro quo* which carries obligations complementary to the favors. In the Hay memorandum[8] sent to the Senate Committee on Foreign Relations while the Hay-Pauncefote treaty was under consideration, it is said: "These rules (those of Article III) are adopted in the treaty with Great Britain as a consideration for getting rid of the Clayton-Bulwer treaty." In the Hay-Pauncefote treaty Great Britain definitely renounced her legal right, existent under the Clayton-Bulwer treaty, of sharing with the United States in the control and protection of the canal. In consenting to the supersession of the Clayton-Bulwer treaty she gave up the only treaty right with the United States known to the writer by which a non-American nation had a voice in, and consequent possibility of interference with, matters in this hemisphere external to those covered by direct treaties between the several non-American and American nations. And more than this,—Great Britain gave up the right, the duty even, of inviting other nations to join with her and the United States in stipulations similar to those of the Clayton-Bulwer treaty. It is plain that the United States not only gained the free hand she wanted in canal matters, when the Hay-Pauncefote treaty was concluded, but also that the Monroe Doctrine was immensely strengthened, not to say rehabilitated. The impairment of the Monroe Doctrine by the Clayton-Bulwer treaty, whether due to force of circumstances at the time or done without a realization of its import, has now been remedied, and the United States can maintain it with no embarrassing exception to explain.

[8] Senate Document No. 746, 61st Congress, 3d Session.

With the obstacle presented by the Clayton-Bulwer treaty cleared away, everything bade fair for the attainment of the wish of this country to build and control the canal. After much discussion the Panama route was decided upon, which was doubtless good engineering, though with that we are not concerned here; it was certainly good statesmanship to dispose of any possible rival, both in a business sense and with a view to obviating any possible future diplomatic disagreements. No great difficulty was anticipated in reaching an agreement with Colombia, which was bound to be greatly benefited by the canal and was too weak financially to dream of undertaking it alone. But negotiations dragged, for Colombia insisted on terms that were considered unreasonable in this country. Then one morning Panama was born, and the United States hastened to make with the infant republic a canal treaty that was concluded November 18, 1903, two years to a day after the Hay-Pauncefote treaty was concluded. This treaty with Panama, quoted at the end of this paper, is the second one upon which the international status of the canal rests. It is the only treaty with an American nation, as the Hay-Pauncefote treaty is the only one with a non-American nation, that directly enters into stipulations concerning the Panama Canal. It is true that the 35th Article of the treaty of 1846 with New Grenada, now Colombia, bore upon the transit across the Isthmus of Panama; but the successful revolution of Panama carried with it the assumption by Panama of all the rights and obligations of that article to the exclusion of Colombia, on the principle that treaties run with the land. The treaty of 1903, moreover, covers these points more fully than did the treaty of 1846.

There is one other treaty and two protocols that are concerned with transit over the Isthmus. The Gadsden treaty of 1853 with Mexico contains in Article VIII stipulations concerning transit over "a plank and rail road across the Isthmus of Tehuantepec." This has no bearing on the Panama Canal. The two protocols were identical, concluded December 1, 1900, with Costa Rica and Nicaragua, and looked to more definite later engagements concerning a canal by the Nicaragua route. They were anticipatory only and have no bearing on the Panama Canal, as the canal to which they referred has not been built.

It thus appears that with two nations only have we direct treaty engagements concerning the Panama Canal—Great Britain

and Panama. We are not legally answerable by reason of contractual obligations to any other nation for our control and operation of the canal. The only possible exception to this statement that occurs to the writer is that "most favored nation" treatment might possibly be held to apply to canal matters, though it is difficult to see how. The wording of Article III (1) of the Hay-Pauncefote treaty, confirmed by that of Article XVIII of the treaty with Panama, does, however, undoubtedly place upon us a moral obligation toward all the nations of the earth until those treaties are denounced or superseded. What has been said before has been inspired by no desire to lessen that obligation, but simply to point out its different character, which is moral toward the world at large in so far as matters are concerned about which we have made declarations affecting all nations in our treaties with Great Britain and Panama; legally we are under obligations to those two countries only.

Of the two the Hay-Pauncefote treaty is the one the more likely to give rise to international and diplomatic questions, for the treaty with Panama followed after and was based upon it. Of the four essential articles of the Hay-Pauncefote treaty, Article I concerns Great Britain and the United States only. Article IV enunciates the mutual agreement providing that no change of sovereignty or of the international relations of the country traversed by the canal shall affect the general principle of neutralization or the obligation of the high contracting parties. It is not inconceivable that this article may at some time give rise to international questions of gravity; but it is so improbable that it needs no further mention than to point out that the opening words of the article, "It is agreed," point to a joint responsibility of the two nations that they shall work to the same end in the settlement of such a question, should it arise. The canal is now building by the United States, "directly at its own cost," pursuant to Article II, which also provides that "subject to the provisions of the present treaty" the United States "shall have and enjoy all the rights incident to such construction, as well as the exclusive right of providing for the regulation and management of the canal." The vital provisions that limit the powers of the United States are found in Article III, and it is this article that is most apt to give rise to diplomatic questions, as it has already given rise to the question of tolls now pending. With this mere

mention of tolls the subject will be dismissed, for it would be manifestly improper for the writer to discuss it at the present time and in this journal.

Article III enunciates certain rules to govern the conduct of the canal, and it is worth while to observe very carefully the reading of the opening sentence preceding the rules themselves. In the first place the rules are adopted "as the basis of the neutralization of such ship canal," and for no other stated purpose whatever; *i. e.*, the rules are in pursuance of the "'general principle' of neutralization" cited in the preamble of the treaty. In the second place the opening words of the article are "The United States adopts," not "the High Contracting Parties adopt," or "it is agreed," or any such words implying dual responsibility. By virtue of this language in the treaty the United States adopts alone, with the assent of Great Britain, the rules governing that status of the canal termed neutralization, and in consequence the United States is alone responsible for maintaining that status itself. In the third place, the wording regarding the rules is "the following Rules, substantially as embodied in the Convention of Constantinople." The rules of the Hay-Pauncefote treaty are not said to be substantially "those" embodied in the Convention of Constantinople, but substantially "as." In other words, the rules of the Constantinople Convention are not all (that might apply) adopted, but those that are adopted are substantially as they appear in that instrument. This is a very real distinction that has not always been kept clearly in mind by writers on canal matters. Thus the right of the United States to fortify the canal has been challenged at home and abroad, though never by any government, and the prohibition of fortifications in the Constantinople Convention has been urged as a reason why fortifications at Panama would violate the spirit of the rules of the Hay-Pauncefote treaty. That question has been settled and the work on the Panama Canal fortifications is now in progress. Again there are those who hold that the United States in war would have to permit the ships of her enemy to pass freely through the canal because of the wording of Rule 1 of the Hay-Pauncefote treaty, taken in connection with the reference to the rules of the Constantinople Convention in the opening sentence of Article III. In Article IV of the latter occur the words "The Maritime Canal remaining open *in time of war* as a free passage, *even to the ships*

of war of belligerents . . . . the high contracting parties agree that no right of war, no act of hostility, nor any act having for its object to obstruct the free navigation of the canal, shall be committed in the canal and its ports of access, as well as within a radius of three marine miles from those ports, *even though the Ottoman Empire should be one of the belligerent powers.*"[8] No such words as those italicized appear in the Hay-Pauncefote treaty rules; and, if the remarks recently made at a public banquet by a gentleman high in the councils of state are any indication of governmental policy, no such suicidal thing is apt to occur as permitting a free passage through the canal of our own enemy's ships of war, on an errand inimical to us.

Considered as a question of language the writer does not believe that the word "neutralization" is applicable to the present status of the Panama Canal. "Neutralized" and "neutralization" imply a status maintained by mutual agreement of so many powerful nations that there can be no hope of a successful violation of that status by any one, or by any combination. At Panama the United States stands alone. But whatever the word used the thing aimed at is perfectly plain, and the word "neutralization" may be accepted for want of a better. The United States is sole sponsor for the neutralization of the canal.

Considering now the rules themselves, it will be noted that all but the first have reference to a state of war. This is to be expected because the idea of neutralization is correlative to that of a state of war; neutralization is imposed to meet the conditions arising in actual war or in anticipation of those that may arise in a future war. A first reading of Rule 1 leads to the impression that it is out of place in rules providing for neutralization; but closer consideration shows that it belongs where it is properly enough. By the very omission of reference to time of war the intention is evident that the rule is intended to cover all times, including time of war. A very important exception to this last statement must be made, however: the rule does apply to times of war in which the *United States herself is not a belligerent, but does not apply to her enemy's war vessels when she is a belligerent.* This limitation is not expressly stated but it is borne out by the history of the rule, which had its prototype in Article I of the

[8] Italics the writer's.

Constantinople Convention.[*] That article reads in part: "The Suez Maritime Canal shall always be free and open, in time of war as in time of peace, to every vessel of commerce or of war, without distinction of flag. Consequently the High Contracting Parties agree not in any way to interfere with the free use of the Canal in time of war as in time of peace." The words "always" and "in time of war as in time of peace" of this article are absent from Rule 1 of the Hay-Pauncefote treaty. It will be remembered that the original draft of the Hay-Pauncefote treaty was made in 1900 and contained rules for the neutralization of the canal. Rule 1 of the original draft, in general tenor similar to Rule 1 of the accepted treaty, did contain the words "in time of war as in time of peace." That draft was materially amended in the Senate, and, as amended, it was unacceptable to Great Britain. One of the Senate amendments provided "that none of the immediate foregoing conditions and stipulations . . . . shall apply to measures which the United States may find it necessary to take for securing by its own forces the defense of the United States and the maintenance of public order." The original draft also provided, in Rule 7, that "no fortifications shall be erected commanding the Canal or the waters adjacent." Great Britain held that the amendment referred to above, called the Davis amendment, and Rule 7 were incompatible. In the Hay memorandum, previously cited, which went to the Senate Committee in explanation of the later and accepted draft of the treaty, Mr. Hay said:

> His Majesty's Government . . . thought that . . . it would be impossible to determine what might be the effect if one clause permitting defensive measures and another clause (which has now been omitted) prohibiting fortification of the Canal were allowed to stand side by side in the same convention.
>
> This amendment was strenuously objected to by Great Britain as involving a distinct departure from the principle of neutrality . . .
>
> No longer insisting upon the language of the Davis amendment—which had in terms reserved to the United States express permission to disregard the rules of neutrality prescribed, when necessary to secure its own defense, which the Senate had apparently deemed necessary because of the provision in Rule 1, that the canal should be free and open "in time of war as in time of peace" to the vessels of all nations—it was considered that the omission of the words "in time of war as

[*] Printed at the end of this paper.

in time of peace" would dispense with the necessity of the amendment referred to, *and that war between the contracting parties, or between the United States and any other power, would have the ordinary effect of war upon treaties when not specially otherwise provided, and would remit both parties to their original and natural right of self-defense and give to the United States the clear right to close the canal against the other belligerent, and to protect it and defend itself by whatever means might be necessary.*[11]

The statement just quoted was made by one negotiator of the treaty and was presented to the Senate Committee having the treaty in charge, and there can be no reasonable doubt that the Senate ratified the treaty with a clear understanding of this matter. It is thus seen that the exception noted above to the general interpretation of Rule 1 is fully justified. If it be objected that this represents the views of only one party to the treaty, the words of Lord Lansdowne in his memorandum of August 3, 1901, may carry the conviction that this interpretation was understood by Great Britain also. In that memorandum[12] he says:

> I understand that by the omission of all reference to the matter of defense the United States Government desires to reserve the power of taking measures to protect the Canal, at any time when the United States may be at war, from destruction or damage at the hands of an enemy or enemies. On the other hand, I conclude that, with the above exception, there is no intention to derogate from the principles of neutrality laid down by the rules. As to the first of these propositions I am not prepared to deny that contingencies may arise when, not only from a national point of view, but on behalf of the commercial interests of the whole world, it might be of supreme importance to the United States that they should be free to adopt measures for the defense of the Canal at a moment when they were themselves engaged in hostilities.

It may be added that Lord Pauncefote, the British Plenipotentiary in the negotiation of the treaty, was one of the British representatives in the negotiation of the Constantinople Convention, and must be assumed therefore to have been especially qualified to note the effect of the deviation in the Hay-Pauncefote treaty rules from those of the rules governing the Suez Canal.

Taken collectively the Hay-Pauncefote treaty rules define the attitude of the United States in the management of the canal to be built. Rule 1 opens the canal on terms of equality to the vessels of commerce and of war of all nations "observing these

[11] Italics the writer's.

[12] Supplement, American Journal of International Law, Vol. V, No. 3, July, 1911.

rules." If any nation, or its citizens or subjects, declines or fails to observe the rules it may not use the canal. The rule is silent as to specific times when it is applicable, times of war or times of peace; the manifest inference is that free passage in time of war is permissible, to which the exception already noted must be added. The rule may be stated to mean, in effect, that the canal shall be free and open to the vessels of commerce and of war of all nations observing these rules, on terms of entire equality, *provided the voyage of the vessel be innocent in character as toward the United States,* so that, etc.

By inference the interpretation above leaves in the category of vessels entitled to free passage through the canal those private vessels of enemies of the United States in war that are engaged in voyages of an innocent character. For instance, supposing a war between France and the United States, a French vessel loaded with guano, on a voyage from Peru to Canada, would be freely entitled to passage through the canal. The writer believes this interpretation to be correct. In the present development of international law the question is rather academic, for the French master would scarcely run the risk of capture by United States ships outside the three mile limit at the canal ends. But if the principle of the inviolability of private property at sea becomes established in international law the question will at once be a practical one. It is not entirely academic now, as will be seen from a perusal of Article XII of the treaty of 1871 between the United States and Italy which reads:

> The High Contracting Parties agree that in the unfortunate event of a war between them the private property of their respective citizens and subjects, with the exception of contraband of war, shall be exempt from capture or seizure on the high seas or elsewhere by the armed vessels or by the military forces of either party, it being understood that this exemption shall not extend to vessels and their cargoes which may attempt to enter a port blockaded by the naval forces of either party. (Treaties in Force, 1904, p. 453.)

The remaining five rules are essentially prohibitions of a nature similar to those the United States would enforce in her own territorial waters for the preservation of national neutrality in a war between other nations. The effect of them all is that the United States will not permit the canal to be used as a base by either belligerent in a war between foreign powers.

When the Hay-Pauncefote treaty was negotiated the canal routes lay through foreign territory in which the exercise of sovereignty could only legally appertain to the nation, or nations, through whose territory the canal would pass. This condition was entirely changed by the treaty with Panama, made two years later. The changed condition cannot, in equity, be regarded as making any change in the attitude of the United States toward Great Britain in the interpretation of the Hay-Pauncefote treaty; for the treaty with Panama came after it, was made possible by it, and in Article XVIII expressly states that the canal shall be opened in conformity with all the stipulations of it. But toward every other nation the treaty with Panama very materially changed the rights of the United States in her control and management of the canal, as will be seen by an examination of its provisions.

In Article II[12] Panama "grants to the United States in perpetuity the use, occupation and control" of certain lands, land under water and waters for canal purposes. In Article IV Panama grants in perpetuity a monopoly for any system of interoceanic communication by canal or railroad across its territory. In Article III

> The Republic of Panama grants to the United States all the rights, power and authority within the zone mentioned and described in Article II of this agreement and within the limits of all auxiliary lands and waters mentioned and described in said Article II which the United States would possess and exercise if it were the sovereign of the territory within which said lands and waters are located to the entire exclusion of the exercise by the Republic of Panama of any such sovereign rights, power or authority.

The title to the lands and waters, the use of which is ceded, still vests in Panama, and the compensation, including an annual rental, is provided for in Article XIV; but the abstract right of title does not affect the concrete right of the United States to exercise sovereignty in the Canal Zone to the exclusion of Panama. The Canal Zone is thus virtually and legally as much a part of the United States as is the Mississippi Valley, and the United States has the same interest and right, and indeed the same obligation, to take measures against the violation of the neutrality of the Canal Zone, and against hostile acts toward her

[12] See text following this paper.

property there, by belligerents, that she has for ensuring the same objects in the Mississippi Valley or any other part of her territorial possessions. Great Britain can legally hold us to the duty of maintaining neutrality in the Canal Zone by virtue of the terms of the Hay-Pauncefote treaty; on the other hand, as far as the rest of the world is concerned, we have that right and duty naturally in consequence of the treaty with Panama, whether the Hay-Pauncefote treaty be in existence or not.

The cities of Colon and Panama with their adjacent harbors are not included in, but are expressly excluded from, the grant of the Canal Zone. Even in them, however, Panama has yielded some attributes of sovereignty to the United States, as will be seen from a reading of Articles VII and X.

The treaty with Panama is largely occupied with matters that are of interest only to the two countries concerned in making it. There are, however, several things of international interest that have not yet been touched upon. The most important of these is the subject of Article I, which reads: "The United States guarantees and will maintain the independence of the Republic of Panama." This imposes a serious duty upon the United States that was not without some bearing on the question of fortifications and a permanent garrison in the Canal Zone, now happily settled. The guarantee is of great importance to Panama; and it is also of great importance to the United States, for it ensures for the future that no embarrassing questions will arise from the possibility of an attack upon Panama by a more powerful neighbor; the announcement of the guarantee will probably suffice to attain the object, but the means will be at hand to enforce the guarantee if necessary. It would be intolerable to have a war of aggression going on in the vicinity of the canal, and the guarantee is worth the assumption of the responsibility involved.

The language of Article I is unqualified, and the announcement that the United States "will maintain" the independence of Panama, read by itself, is capable of the interpretation that the United States will maintain that independence even against the wishes of Panama to the contrary; and very good reasons are apparent why such an interpretation would be to the interest of the United States. But the language of the second paragraph of Article XXIV shows that the guarantee of independence is not intended to prohibit Panama from merging her independence in

another state if she so wishes; for it expressly provides that, in such a contingency, the rights of the United States under this treaty shall remain unimpaired. As the treaty must be interpreted as a whole, the plain meaning of Article I is that the independence of Panama is guaranteed and will be maintained against the assaults of any enemy of that state.

The first paragraph of Article XXIV provides that no change in the treaties of Panama shall, "without the consent of the United States, affect any right of the United States under the present convention, or under any treaty stipulation between the two countries that now exists or may hereafter exist touching the subject matter of this convention." This is an evident matter of international interest, looking to the future. In a similar way, looking to the past, Article XX provides for annulment or modification of any treaty in relation to the territory of the Isthmus of Panama, the obligations of which have descended to or been assumed by the Republic of Panama, whereby any privilege or concession is granted relative to means of interoceanic communication that is incompatible with the terms of the treaty under discussion. The writer does not know of any formal announcement that the provisions of Article XX have been complied with. If they have not there is a possibility of interesting diplomatic questions arising out of that article.

Article IX provides on the part of the United States that the ports at the canal entrances, and on the part of Panama that the towns of Colon and Panama, shall be free ports for vessels using or passing through the canal, with exceptions covering canal tolls, articles destined for other parts of the Republic of Panama, and vessels touching at Colon and Panama without passing through the canal.

Articles XXIII and XXV may be considered together, as both bear upon the protection of the canal. Article XXIII explicitly permits the United States to use her police and her land and naval forces, and to establish fortifications to ensure the safety and protection of the canal and its auxiliaries. This bears upon the right of the United States to fortify the canal, if that right needs further argument; for it is plain that the negotiators of this treaty with Panama would never have put in the authorization to establish fortifications if they had believed fortifications were forbidden, by implication or otherwise, by the Hay-Pauncefote

treaty. In Article XXV Panama agrees to sell or lease lands for naval and coaling stations "to the end of the efficient protection of the Canal and the preservation of its neutrality." The use of the word "sell" in this article is noteworthy; it carries with it the possibility of the actual transfer of title, and with the title sovereignty. The title to the Canal Zone did not pass under the provisions of Article III. Both Article XXIII and Article XXV point to a belief of the two governments that something more than a mere dictum of the United States is necessary to enable her to ensure the safety and protection of the canal, and to maintain its neutrality.

Summing up, the international status of the canal appears to the writer to be as follows:

(a) The canal is free (for passage but not in respect of tolls) and open to all private vessels of nations observing the rules of the Hay-Pauncefote treaty.

(b) The canal is similarly free and open to men-of-war, even to those of belligerents when the United States is not a party to the war.

(c) To these permissive conditions the exception may be anticipated that the United States, when herself engaged in war, will not allow the war vessels of her enemies to use the canal, nor her enemies' private vessels, unless the character of the voyage be innocent as regards the United States.

(d) The other conditions are prohibitive, and of the nature that the United States would enforce in her own ports for the preservation of neutrality and the protection of her own property. They are so explicitly stated that nothing more than a reference to them, Rules 2 to 6 inclusive, Article III, is necessary here.

(e) The United States stands alone as the guarantor that the canal shall be kept free and open in accordance with the Hay-Pauncefote rules.

(f) The canal will be protected by permanent fortifications and a military garrison.

The Suez Canal afforded the only precedent for establishing the status of the Panama Canal. The two are alike in the fact that each is an artificial waterway connecting two great oceans, whereby trade routes may be shortened thousands of miles. The two are very unlike in several other particulars. The Panama Canal is being constructed by the United States as a government

enterprise; the Suez Canal was built and is now owned by a private company of which the British Government later became a large stockholder, but is not now sole proprietor. The Suez Canal is comparatively near to several strong European States having diverse interests, while the Panama Canal is separated by the width of a great ocean from any first-class power. The Suez Canal is on the common shortest route of several European powers to their important colonies; this is not the case with the Panama Canal as regards European countries, but the United States has a vital interest in it because it makes a short route between the Atlantic and Pacific coasts. The Suez Canal is in Egypt, which is a suzerainty of Turkey, whose territorial rights are expressly reserved in Article XXII of the Constantinople Convention; the Panama Canal passes through territory in which the United States exercises sovereignty to the exclusion of such exercise by Panama. Enough has been said to show the wide differences in important particulars of the two great artificial waterways. Such differences in physical status are quite sufficient to account for differences in international status.

The text of the Constantinople Convention governing "the free navigation of the Suez Maritime Canal" is printed at the end of this paper, and the reader can compare for himself its provisions with those of the Hay-Pauncefote treaty. A few of the more noticeable divergencies may be pointed out, however. In the first place the Suez Canal is really neutralized by a concert of nine European powers, although the words "neutralization" and "neutrality" are carefully omitted, and the language is "free and open," "open . . . as a free passage," or "free use"; Turkey, the sovereign power, is one of the nine signatories. On the other hand the Panama Canal is not neutralized by a concert of powers, though the word "neutralization" is used in the Hay-Pauncefote treaty; the United States is the sole guarantor of the condition so characterized. Again, Turkey expressly gives up, in Article IV, the right to exercise any war right or commit any act of hostility in the canal situated in her own sovereign territory; the United States is not so restricted by the Hay-Pauncefote treaty. Permanent fortifications are forbidden by the Constantinople Convention, Article VIII and Article XI; they are not forbidden by the Hay-Pauncefote treaty. Comment has already been made upon the omission in the Hay-Pauncefote treaty of the words

"in time of war as in time of peace" found in Article I of the Constantinople Convention.

The natural cause of these divergencies may be found in the entirely different relation borne to the Panama Canal by the United States from that borne to the Suez Canal by any one European State. The Panama Canal is of paramount importance to us for commercial and military reasons, and the latter were very freely advanced before construction began, though they are now somewhat forgotten in the discussion of commercial matters. The Suez Canal was begun purely as a commercial enterprise in which the interests of many nations ran parallel, and military advantage was incidental. Put in another way, the Panama Canal was a necessity for us; the Suez Canal was a great convenience to Europe. For these reasons, and also because of the Monroe Doctrine, it was worth while to undertake single-handed the guarantee at Panama that the European nations collectively undertook at Suez. It very naturally follows that guns and soldiers are necessary to enable a single nation to maintain what the pronouncement of a concert of nations will effect by moral suasion. And it equally follows by every rule of common sense and self-preservation that the United States in undertaking such a responsibility will not be Quixotic enough to maintain a canal for the use of her own enemies in war.

Notwithstanding the divergencies the great fact stands out that the management of both canals is on a general basis of equal treatment to all with special advantage to none. Unless the United States be herself at war the international status of the two canals is practically the same.

CONVENTION BETWEEN GREAT BRITAIN, GERMANY, AUSTRIA-HUNGARY, SPAIN, FRANCE, ITALY, THE NETHERLANDS, RUSSIA, AND TURKEY, RESPECTING THE FREE NAVIGATION OF THE SUEZ MARITIME CANAL.[14]

Signed at Constantinople, October 29, 1888.

(Ratifications deposited at Constantinople, December 22, 1888.)

HER Majesty the Queen of the United Kingdom of Great Britain and Ireland, Empress of India; His Majesty the Emperor of Germany, King of Prussia; His Majesty the Emperor of Austria, King of Bohemia, &c., and Apostolic King of Hungary; His Majesty the King of Spain,

[14] Parliamentary State Papers, Commercial, No. 2 (Suez Canal), 1889. [C.-5623.]

and in his name the Queen Regent of the Kingdom; the President of the French Republic; His Majesty the King of Italy; His Majesty the King of the Netherlands, Grand Duke of Luxembourg, &c.; His Majesty the Emperor of All the Russias; and His Majesty the Emperor of the Ottomans; wishing to establish, by a Conventional Act, a definite system destined to guarantee at all times, and for all the Powers, the free use of the Suez Maritime Canal, and thus to complete the system under which the navigation of this Canal has been placed by the Firman of His Imperial Majesty the Sultan, dated the 22nd February, 1866 (2 Zilkadé, 1282), and sanctioning the Concessions of His Highness the Khedive, have named as their Plenipotentiaries, that is to say:

(Here follow the names of the several Plenipotentiaries.)

Who, having communicated to each other their respective full powers, found in good and due form, have agreed upon the following Articles:

ARTICLE I.

The Suez Maritime Canal shall always be free and open, in time of war as in time of peace, to every vessel of commerce or of war, without distinction of flag.

Consequently, the High Contracting Parties agree not in any way to interfere with the free use of the Canal, in time of war as in time of peace.

The Canal shall never be subjected to the exercise of the right of blockade.

ARTICLE II.

The High Contracting Parties, recognizing that the Fresh-Water Canal is indispensable to the Maritime Canal, take note of the engagements of His Highness the Khedive towards the Universal Suez Canal Company as regards the Fresh-Water Canal; which engagements are stipulated in a Convention bearing date the 18th March, 1863, containing an *exposé* and four Articles.

They undertake not to interfere in any way with the security of that Canal and its branches, the working of which shall not be exposed to any attempt at obstruction.

ARTICLE III.

The High Contracting Parties likewise undertake to respect the plant, establishments, buildings, and works of the Maritime Canal and of the Fresh-Water Canal.

ARTICLE IV.

The Maritime Canal remaining open in time of war as a free passage, even to the ships of war of belligerents, according to the terms of Article I of the present Treaty, the High Contracting Parties agree that no right of war, no act of hostility, nor any act having for its object to obstruct the free navigation of the Canal, shall be committed in the Canal and its

ports of access, as well as within a radius of 3 marine miles from those ports, even though the Ottoman Empire should be one of the belligerent Powers.

Vessels of war of belligerents shall not revictual or take in stores in the Canal and its ports of access, except in so far as may be strictly necessary. The transit of the aforesaid vessels through the Canal shall be effected with the least possible delay, in accordance with the Regulations in force, and without any other intermission than that resulting from the necessities of the service.

Their stay at Port Said and in the roadstead of Suez shall not exceed twenty-four hours, except in case of distress. In such case they shall be bound to leave as soon as possible. An interval of twenty-four hours shall always elapse between the sailing of a belligerent ship from one of the ports of access and the departure of a ship belonging to the hostile Power.

ARTICLE V.

In time of war belligerent Powers shall not disembark nor embark within the Canal and its ports of access either troops, munitions, or materials of war. But in case of an accidental hindrance in the Canal, men may be embarked or disembarked at the ports of access by detachments not exceeding 1,000 men, with a corresponding amount of war material.

ARTICLE VI.

Prizes shall be subjected, in all respects, to the same rules as the vessels of war of belligerents.

ARTICLE VII.

The Powers shall not keep any vessel of war in the waters of the Canal (including Lake Timsah and the Bitter Lakes).

Nevertheless, they may station vessels of war in the ports of access of Port Said and Suez, the number of which shall not exceed two for each Power.

This right shall not be exercised by belligerents.

ARTICLE VIII.

The Agents in Egypt of the Signatory Powers of the present Treaty shall be charged to watch over its execution. In case of any event threatening the security or the free passage of the Canal, they shall meet on the summons of three of their number under the presidency of their Doyen, in order to proceed to the necessary verifications. They shall inform the Khedivial Government of the danger which they may have perceived, in order that that Government may take proper steps to insure the protection and the free use of the Canal. Under any circumstances, they shall meet once a year to take note of the due execution of the Treaty.

The last-mentioned meetings shall take place under the presidency of a Special Commissioner nominated for that purpose by the Imperial

Ottoman Government. A Commissioner of the Khedive may also take part in the meeting, and may preside over it in case of the absence of the Ottoman Commissioner.

They shall especially demand the suppression of any work or the dispersion of any assemblage on either bank of the Canal, the object or effect of which might be to interfere with the liberty and the entire security of the navigation.

ARTICLE IX.

The Egyptian Government shall, within the limits of its powers resulting from the Firmans, and under the conditions provided for in the present Treaty, take the necessary measures for insuring the execution of the said Treaty.

In case the Egyptian Government should not have sufficient means at its disposal, it shall call upon the Imperial Ottoman Government, which shall take the necessary measures to respond to such appeal; shall give notice thereof to the Signatory Powers of the Declaration of London of the 17th March, 1885; and shall, if necessary, concert with them on the subject.

The provisions of Articles IV, V, VII, and VIII shall not interfere with the measures which shall be taken in virtue of the present Article.

ARTICLE X.

Similarly, the provisions of Articles IV, V, VII, and VIII shall not interfere with the measures which His Majesty the Sultan and His Highness the Khedive, in the name of His Imperial Majesty, and within the limits of the Firmans granted, might find it necessary to take for securing by their own forces the defence of Egypt and the maintenance of public order.

In case His Imperial Majesty the Sultan, or His Highness the Khedive, should find it necessary to avail themselves of the exceptions for which this Article provides, the Signatory Powers of the Declaration of London shall be notified thereof by the Imperial Ottoman Government.

It is likewise understood that the provisions of the four Articles aforesaid shall in no case occasion any obstacle to the measures which the Imperial Ottoman Government may think it necessary to take in order to insure by its own forces the defence of its other possessions situated on the eastern coast of the Red Sea.

ARTICLE XI.

The measures which shall be taken in the cases provided for by Articles IX and X of the present Treaty shall not interfere with the free use of the Canal. In the same cases, the erection of permanent fortifications contrary to the provisions of Article VIII is prohibited.

ARTICLE XII.

The High Contracting Parties, by application of the principle of equality as regards the free use of the Canal, a principle which forms one of the

bases of the present Treaty, agree that none of them shall endeavor to obtain with respect to the Canal territorial or commercial advantages or privileges in any international arrangements which may be concluded. Moreover, the rights of Turkey as the territorial Power are reserved.

ARTICLE XIII.

With the exception of the obligations expressly provided by the clauses of the present Treaty, the sovereign rights of His Imperial Majesty the Sultan, and the rights and immunities of His Highness the Khedive, resulting from the Firmans, are in no way affected.

ARTICLE XIV.

The High Contracting Parties agree that the engagements resulting from the present Treaty shall not be limited by the duration of the Acts of Concession of the Universal Suez Canal Company.

ARTICLE XV.

The stipulations of the present Treaty shall not interfere with the sanitary measures in force in Egypt.

ARTICLE XVI.

The High Contracting Parties undertake to bring the present Treaty to the knowledge of the States which have not signed it, inviting them to accede to it.

ARTICLE XVII.

The present Treaty shall be ratified, and the ratifications shall be exchanged at Constantinople within the space of one month, or sooner if possible.

In faith of which the respective Plenipotentiaries have signed the present Treaty, and have affixed to it the seal of their arms.

Done at Constantinople, the 29th day of the month of October, in the year 1888.

[L. S.] W. A. WHITE.
[L. S.] RADOWITZ.
[L. S.] CALICE.
[L. S.] MIGUEL FLOREZ Y GARCIA.
[L. S.] G. DE MONTEBELLO.
[L. S.] A. BLANC.
[L. S.] GUS. KEUN.
[L. S.] NÉLIDOW.
[L. S.] M. SAÏD.

TREATY TO FACILITATE THE CONSTRUCTION OF A SHIP CANAL.

Concluded November 18, 1901; ratification advised by Senate December 16, 1901; ratified by President December 26, 1901; ratifications exchanged February 21, 1902; proclaimed February 22, 1902. (U. S. Stat., vol. 32, p. 1903.)

ARTICLES.

I. Convention of April 19, 1850.
II. Construction of canal.
III. Rules of neutralization.
IV. Change of sovereignty.
V. Ratification.

The United States of America and His Majesty Edward the Seventh, of the United Kingdom of Great Britain and Ireland, and of the British Dominions beyond the Seas, King, and Emperor of India, being desirous to facilitate the construction of a ship canal to connect the Atlantic and Pacific Oceans, by whatever route may be considered expedient, and to that end to remove any objection which may arise out of the Convention of the 19th April, 1850, commonly called the Clayton-Bulwer Treaty, to the construction of such canal under the auspices of the Government of the United States, without impairing the "general principle" of neutralization established in Article VIII of that Convention, have for that purpose appointed as their Plenipotentiaries:

The President of the United States, John Hay, Secretary of State of the United States of America;

And His Majesty Edward the Seventh, of the United Kingdom of Great Britain and Ireland, and of the British Dominions beyond the Seas, King, and Emperor of India, the Right Honourable Lord Pauncefote, G. C. B., G. C. M. G., His Majesty's Ambassador Extraordinary and Plenipotentiary to the United States;

Who, having communicated to each other their full powers, which were found to be in due and proper form, have agreed upon the following Articles:

ARTICLE I.

The High Contracting Parties agree that the present Treaty shall supersede the afore-mentioned Convention of the 19th April, 1850.

ARTICLE II.

It is agreed that the canal may be constructed under the auspices of the Government of the United States, either directly at its own cost, or by gift or loan of money to individuals or Corporations, or through subscription to or purchase of stock or shares, and that, subject to the provisions of the present Treaty, the said Government shall have and enjoy all the rights incident to such construction, as well as the exclusive right of providing for the regulation and management of the canal.

ARTICLE III.

The United States adopts, as the basis of the neutralization of such ship canal, the following Rules, substantially as embodied in the Convention of Constantinople, signed the 28th October, 1888, for the free navigation of the Suez Canal, that is to say:

1. The canal shall be free and open to the vessels of commerce and of war of all nations observing these Rules on terms of entire equality, so that there shall be no discrimination against any such nation, or its citizens or subjects, in respect of the conditions or charges of traffic, or otherwise. Such conditions and charges of traffic shall be just and equitable.

2. The canal shall never be blockaded, nor shall any right of war be exercised nor any act of hostility be committed within it. The United States, however, shall be at liberty to maintain such military police along the canal as may be necessary to protect it against lawlessness and disorder.

3. Vessels of war of a belligerent shall not revictual nor take any stores in the canal except so far as may be strictly necessary; and the transit of such vessels through the canal shall be effected with the least possible delay in accordance with the Regulations in force, and with only such intermission as may result from the necessities of the service.

Prizes shall be in all respects subject to the same Rules as vessels of war of the belligerents.

4. No belligerent shall embark or disembark troops, munitions of war, or warlike materials in the canal, except in case of accidental hindrance of the transit, and in such case the transit shall be resumed with all possible dispatch.

5. The provisions of this Article shall apply to waters adjacent to the canal, within 3 marine miles of either end. Vessels of war of a belligerent shall not remain in such waters longer than twenty-four hours at any one time, except in case of distress, and in such case, shall depart as soon as possible; but a vessel of war of one belligerent shall not depart within twenty-four hours from the departure of a vessel of war of the other belligerent.

6. The plant, establishments, buildings, and all work necessary to the construction, maintenance, and operation of the canal shall be deemed to be part thereof, for the purposes of this Treaty, and in time of war, as in time of peace, shall enjoy complete immunity from attack or injury by belligerents, and from acts calculated to impair their usefulness as part of the canal.

ARTICLE IV.

It is agreed that no change of territorial sovereignty or of the international relations of the country or countries traversed by the beforementioned canal shall affect the general principle of neutralization or the obligation of the High Contracting Parties under the present Treaty.

ARTICLE V.

The present Treaty shall be ratified by the President of the United States, by and with the advice and consent of the Senate thereof, and by

His Brittanic Majesty; and the ratifications shall be exchanged at Washington or at London at the earliest possible time within six months from the date hereof.

In faith whereof the respective Plenipotentiaries have signed this Treaty and thereunto affixed their seals.

Done in duplicate at Washington, the 18th day of November, in the year of Our Lord one thousand nine hundred and one.

JOHN HAY. [SEAL]
PAUNCEFOTE. [SEAL]

CONVENTION FOR THE CONSTRUCTION OF A SHIP CANAL.

Concluded November 18, 1903; ratification advised by the Senate February 23, 1904; ratified by President February 25, 1904; ratifications exchanged February 26, 1904; proclaimed February 26, 1904. (U. S. Stats., vol. 33.)

ARTICLES.

I. Independence of Panama.
II. Canal zone.
III. Authority in canal zone.
IV. Subsidiary rights.
V. Monopoly for construction, etc.
VI. Private property.
VII. Panama; Colon; harbors.
VIII. Panama Canal Company and railroad.
IX. Ports at entrance of canal.
X. Taxes, etc.
XI. Official dispatches.
XII. Access of employees.
XIII. Importation into zone.
XIV. Compensation.
XV. Joint commission.
XVI. Extradition.
XVII. Ports of Panama.
XVIII. Neutrality rules.
XIX. Free transport.
XX. Cancellation of existing treaties.
XXI. Anterior debts, concessions, etc.
XXII. Renunciation of rights under concessionary contracts.
XXIII. Protection of canal.
XXIV. Change in government, laws, etc.
XXV. Coaling stations.
XXVI. Ratification.

The United States of America and the Republic of Panama being desirous to insure the construction of a ship canal across the Isthmus of Panama to connect the Atlantic and Pacific oceans, and the Congress of the United States of America having passed an act approved June 28, 1902, in furtherance of that object, by which the President of the United States is authorized to acquire within a reasonable time the control of the necessary territory of the Republic of Colombia, and the sovereignty of such territory being actually vested in the Republic of Panama, the high contracting parties have resolved for that purpose to conclude a convention and have accordingly appointed as their plenipotentiaries,—

The President of the United States of America, John Hay, Secretary of State, and

The Government of the Republic of Panama, Philippe Bunau-Varilla, Envoy Extraordinary and Minister Plenipotentiary of the Republic of

Panama, thereunto specially empowered by said government, who after communicating with each other their respective full powers, found to be in good and due form, have agreed upon and concluded the following articles:

ARTICLE I.

The United States guarantees and will maintain the independence of the Republic of Panama.

ARTICLE II.

The Republic of Panama grants to the United States in perpetuity the use, occupation and control of a zone of land and land under water for the construction, maintenance, operation, sanitation and protection of said Canal of the width of ten miles extending to the distance of five miles on each side of the center line of the route of the Canal to be constructed; the said zone beginning in the Caribbean Sea three marine miles from mean low water mark and extending to and across the Isthmus of Panama into the Pacific ocean to a distance of three marine miles from mean low water mark with the proviso that the cities of Panama and Colon and the harbors adjacent to said cities, which are included within the boundaries of the zone above described, shall not be included within this grant. The Republic of Panama further grants to the United States in perpetuity the use, occupation and control of any other lands and waters outside of the zone above described which may be necessary and convenient for the construction, maintenance, operation, sanitation and protection of the said Canal or of any auxiliary canals or other works necessary and convenient for the construction, maintenance, operation, sanitation and protection of the said enterprise.

The Republic of Panama further grants in like manner to the United States in perpetuity all islands within the limits of the zone above described and in addition thereto the group of small islands in the Bay of Panama, named Perico, Naos, Culebra and Flamenco.

ARTICLE III.

The Republic of Panama grants to the United States all the rights, power and authority within the zone mentioned and described in Article II of this agreement and within the limits of all auxiliary lands and waters mentioned and described in said Article II which the United States would possess and exercise if it were the sovereign of the territory within which said lands and waters are located to the entire exclusion of the exercise by the Republic of Panama of any such sovereign rights, power or authority.

ARTICLE IV.

As rights subsidiary to the above grants the Republic of Panama grants in perpetuity to the United States the right to use the rivers, streams, lakes and other bodies of water within its limits for navigation, the supply of water or water-power or other purposes, so far as the use of said rivers,

streams, lakes and bodies of water and the waters thereof may be necessary and convenient for the construction, maintenance, operation, sanitation and protection of the said Canal.

ARTICLE V.

The Republic of Panama grants to the United States in perpetuity a monopoly for the construction, maintenance and operation of any system of communication by means of canal or railroad across its territory between the Caribbean Sea and the Pacific ocean.

ARTICLE VI.

The grants herein contained shall in no manner invalidate the titles or rights of private land holders or owners of private property in the said zone or in or to any of the lands or waters granted to the United States by the provisions of any Article of this treaty, nor shall they interfere with the rights of way over the public roads passing through the said zone or over any of the said lands or waters unless said rights of way or private rights shall conflict with rights herein granted to the United States in which case the rights of the United States shall be superior. All damages caused to the owners of private lands or private property of any kind by reason of the grants contained in this treaty or by reason of the operations of the United States, its agents or employees, or by reason of the construction, maintenance, operation, sanitation and protection of the said Canal or of the works of sanitation and protection herein provided for, shall be appraised and settled by a joint Commission appointed by the Governments of the United States and the Republic of Panama, whose decisions as to such damages shall be final and whose awards as to such damages shall be paid solely by the United States. No part of the work on said Canal or the Panama railroad or on any auxiliary works relating thereto and authorized by the terms of this treaty shall be prevented, delayed or impeded by or pending such proceedings to ascertain such damages. The appraisal of said private lands and private property and the assessment of damages to them shall be based upon their value before the date of this convention.

ARTICLE VII.

The Republic of Panama grants to the United States within the limits of the cities of Panama and Colon and their adjacent harbors and within the territory adjacent thereto the right to acquire by purchase or by the exercise of the right of eminent domain, any lands, buildings, water rights or other properties necessary and convenient for the construction, maintenance, operation and protection of the Canal and of any works of sanitation, such as the collection and disposition of sewage and the distribution of water in the said cities of Panama and Colon, which, in the discretion of the United States may be necessary and convenient for the construction, maintenance, operation, sanitation and protection of the said Canal and railroad. All such works of sanitation, collection and

disposition of sewage and distribution of water in the cities of Panama and Colon shall be made at the expense of the United States, and the government of the United States, its agents or nominees shall be authorized to impose and collect water rates and sewerage rates which shall be sufficient to provide for the payment of interest and the amortization of the principal of the cost of said works within a period of fifty years and upon the expiration of said term of fifty years the system of sewers and water works shall revert to and become the properties of the cities of Panama and Colon respectively, and the use of the water shall be free to the inhabitants of Panama and Colon, except to the extent that water rates may be necessary for the operation and maintenance of said system of sewers and water.

The Republic of Panama agrees that the cities of Panama and Colon shall comply in perpetuity with the sanitary ordinances whether of a preventive or curative character prescribed by the United States and in case the Government of Panama is unable or fails in its duty to enforce this compliance by the cities of Panama and Colon with the sanitary ordinances of the United States the Republic of Panama grants to the United States the right and authority to enforce the same.

The same right and authority are granted to the United States for the maintenance of public order in the cities of Panama and Colon and the territories and harbors adjacent thereto in case the Republic of Panama should not be, in the judgment of the United States, able to maintain such order.

ARTICLE VIII.

The Republic of Panama grants to the United States all rights which it now has or hereafter may acquire to the property of the New Panama Canal Company and the Panama Railroad Company as a result of the transfer of sovereignty from the Republic of Colombia to the Republic of Panama over the Isthmus of Panama and authorizes the New Panama Canal Company to sell and transfer to the United States its rights, privileges, properties and concessions as well as the Panama Railroad and all the shares or part of the shares of that company; but the public lands situated outside of the zone described in Article II of this treaty now included in the concessions to both said enterprises and not required in the construction or operation of the Canal shall revert to the Republic of Panama except any property now owned by or in the possession of said companies within Panama or Colon or the ports or terminals thereof.

ARTICLE IX.

The United States agrees that the ports at either entrance of the Canal and the waters thereof, and the Republic of Panama agrees that the towns of Panama and Colon shall be free for all time so that there shall not be imposed or collected custom house tolls, tonnage, anchorage, lighthouse, wharf, pilot, or quarantine dues or any other charges or taxes of any kind upon any vessel using or passing through the Canal or

belonging to or employed by the United States, directly or indirectly, in connection with the construction, maintenance, operation, sanitation and protection of the main Canal, or auxiliary works, or upon the cargo, officers, crew, or passengers of any such vessels, except such tolls and charges as may be imposed by the United States for the use of the Canal and other works, and except tolls and charges imposed by the Republic of Panama upon merchandise destined to be introduced for the consumption of the rest of the Republic of Panama, and upon vessels touching at the ports of Colon and Panama and which do not cross the Canal.

The Government of the Republic of Panama shall have the right to establish in such ports and in the towns of Panama and Colon such houses and guards as it may deem necessary to collect duties on importations destined to other portions of Panama and to prevent contraband trade. The United States shall have the right to make use of the towns and harbors of Panama and Colon as places of anchorage, and for making repairs, for loading, unloading, depositing, or transshipping cargoes either in transit or destined for the service of the Canal and for other works pertaining to the Canal.

ARTICLE X.

The Republic of Panama agrees that there shall not be imposed any taxes, national, municipal, departmental, or of any other class, upon the Canal, the railways and auxiliary works, tugs and other vessels employed in the service of the Canal, store houses, work shops, offices, quarters for laborers, factories of all kinds, warehouses, wharves, machinery and other works, property, and effects appertaining to the Canal or railroad and auxiliary works, or their officers or employees, situated within the cities of Panama and Colon, and that there shall not be imposed contributions or charges of a personal character of any kind upon officers, employees, laborers, and other individuals in the service of the Canal and railroad and auxiliary works.

ARTICLE XI.

The United States agrees that the official dispatches of the Government of the Republic of Panama shall be transmitted over any telegraph and telephone lines established for canal purposes and used for public and private business at rates not higher than those required from officials in the service of the United States.

ARTICLE XII.

The Government of the Republic of Panama shall permit the immigration and free access to the lands and workshops of the Canal and its auxiliary works of all employees and workmen of whatever nationality under contract to work upon or seeking employment upon or in any wise connected with the said Canal and its auxiliary works, with their respective families, and all such persons shall be free and exempt from the military service of the Republic of Panama.

ARTICLE XIII.

The United States may import at any time into the said zone and auxiliary lands, free of custom duties, imposts, taxes, or other charges, and without any restrictions, any and all vessels, dredges, engines, cars, machinery, tools, explosives, materials, supplies, and other articles necessary and convenient in the construction, maintenance, operation, sanitation and protection of the Canal and auxiliary works, and all provisions, medicines, clothing, supplies and other things necessary and convenient for the officers, employees, workmen and laborers in the service and employ of the United States and for their families. If any such articles are disposed of for use outside of the zone and auxiliary lands granted to the United States and within the territory of the Republic, they shall be subject to the same import or other duties as like articles imported under the laws of the Republic of Panama.

ARTICLE XIV.

As the price or compensation for the rights, powers and privileges granted in this convention by the Republic of Panama to the United States, the Government of the United States agrees to pay to the Republic of Panama the sum of ten million dollars ($10,000,000) in gold coin of the United States on the exchange of the ratification of this convention and also an annual payment during the life of this convention of two hundred and fifty thousand dollars ($250,000) in like gold coin, beginning nine years after the date aforesaid.

The provisions of this Article shall be in addition to all other benefits assured to the Republic of Panama under this convention.

But no delay or difference of opinion under this Article or any other provisions of this treaty shall affect or interrupt the full operation and effect of this convention in all other respects.

ARTICLE XV.

The joint commission referred to in Article VI shall be established as follows:

The President of the United States shall nominate two persons and the President of the Republic of Panama shall nominate two persons and they shall proceed to a decision; but in case of disagreement of the Commission (by reason of their being equally divided in conclusion) an umpire shall be appointed by the two Governments who shall render the decision. In the event of the death, absence, or incapacity of a Commissioner or Umpire, or of his omitting, declining or ceasing to act, his place shall be filled by the appointment of another person in the manner above indicated. All decisions by a majority of the Commission or by the umpire shall be final.

ARTICLE XVI.

The two Governments shall make adequate provision by future agreement for the pursuit, capture, imprisonment, detention and delivery within

said zone and auxiliary lands to the authorities of the Republic of Panama of persons charged with the commitment of crimes, felonies or misdemeanors without said zone and for the pursuit, capture, imprisonment, detention and delivery without said zone to the authorities of the United States of persons charged with the commitment of crimes, felonies and misdemeanors within said zone and auxiliary lands.

ARTICLE XVII.

The Republic of Panama grants to the United States the use of all the ports of the Republic open to commerce as places of refuge for any vessels employed in the Canal enterprise, and for all vessels passing or bound to pass through the Canal which may be in distress and be driven to seek refuge in said ports. Such vessels shall be exempt from anchorage and tonnage dues on the part of the Republic of Panama.

ARTICLE XVIII.

The Canal, when constructed, and the entrances thereto shall be neutral in perpetuity, and shall be opened upon the terms provided for by Section 1 of Article three of, and in conformity with all the stipulations of, the treaty entered into by the Governments of the United States and Great Britain on November 18, 1901.

ARTICLE XIX.

The Government of the Republic of Panama shall have the right to transport over the Canal its vessels and its troops and munitions of war in such vessels at all times without paying charges of any kind. The exemption is to be extended to the auxiliary railway for the transportation of persons in the service of the Republic of Panama, or of the police force charged with the preservation of public order outside of said zone, as well as to their baggage, munitions of war and supplies.

ARTICLE XX.

If by virtue of any existing treaty in relation to the territory of the Isthmus of Panama, whereof the obligations shall descend or be assumed by the Republic of Panama, there may be any privilege or concession in favor of the Government or the citizens and subjects of a third power relative to an interoceanic means of communication which in any of its terms may be incompatible with the terms of the present convention, the Republic of Panama agrees to cancel or modify such treaty in due form, for which purpose it shall give to the said third power the requisite notification within the term of four months from the date of the present convention, and in case the existing treaty contains no clause permitting its modifications or annulment, the Republic of Panama agrees to procure its modification or annulment in such form that there shall not exist any conflict with the stipulations of the present convention.

ARTICLE XXI.

The rights and privileges granted by the Republic of Panama to the United States in the preceding Articles are understood to be free of all anterior debts, liens, trusts, or liabilities, or concessions or privileges to other Governments, corporations, syndicates or individuals, and consequently, if there should arise any claims on account of the present concessions and privileges or otherwise, the claimants shall resort to the Government of the Republic of Panama and not to the United States for any indemnity or compromise which may be required.

ARTICLE XXII.

The Republic of Panama renounces and grants to the United States the participation to which it might be entitled in the future earnings of the Canal under Article XV of the concessionary contract with Lucien N. B. Wyse now owned by the New Panama Canal Company and any and all other rights or claims of a pecuniary nature arising under or relating to said concession, or arising under or relating to the concessions to the Panama Railroad Company or any extension or modification thereof; and it likewise renounces, confirms and grants to the United States, now and hereafter, all the rights and property reserved in the said concessions which otherwise would belong to Panama at or before the expiration of the terms of ninety-nine years of the concessions granted to or held by the above mentioned party and companies, and all right, title and interest which it now has or may hereafter have, in and to the lands, canal, works, property and rights held by the said companies under said concessions or otherwise, and acquired or to be acquired by the United States from or through the New Panama Canal Company, including any property and rights which might or may in the future either by lapse of time, forfeiture or otherwise, revert to the Republic of Panama under any contracts or concessions, with said Wyse, the Universal Panama Canal Company, the Panama Railroad Company and the New Panama Canal Company.

The aforesaid rights and property shall be and are free and released from any present or reversionary interest in or claims of Panama and the title of the United States thereto upon consummation of the contemplated purchase by the United States from the New Panama Canal Company, shall be absolute, so far as concerns the Republic of Panama, excepting always the rights of the Republic specifically secured under this treaty.

ARTICLE XXIII.

If it should become necessary at any time to employ armed forces for the safety or protection of the Canal, or of the ships that make use of the same, or the railways and auxiliary works, the United States shall have the right, at all times and in its discretion, to use its police and its land and naval forces or to establish fortifications for these purposes.

ARTICLE XXIV.

No change either in the Government or in the laws and treaties of the Republic of Panama shall, without the consent of the United States, affect any right of the United States under the present convention, or under any treaty stipulation between the two countries that now exists or may hereafter exist touching the subject matter of this convention.

If the Republic of Panama shall hereafter enter as a constituent into any other Government or into any union or confederation of states, so as to merge her sovereignty or independence in such Government, union or confederation, the rights of the United States under this convention shall not be in any respect lessened or impaired.

ARTICLE XXV.

For the better performance of the engagements of this convention and to the end of the efficient protection of the Canal and the preservation of its neutrality, the Government of the Republic of Panama will sell or lease to the United States lands adequate and necessary for naval or coaling stations on the Pacific coast and on the western Caribbean coast of the Republic at certain points to be agreed upon with the President of the United States.

ARTICLE XXVI.

This convention when signed by the Plenipotentiaries of the Contracting Parties shall be ratified by the respective Governments and the ratifications shall be exchanged at Washington at the earliest date possible.

In faith whereof the respective Plenipotentiaries have signed the present convention in duplicate and have hereunto affixed their respective seals.

Done at the City of Washington the 18th day of November in the year of our Lord nineteen hundred and three.

JOHN HAY. [SEAL]
P. BUNAU VARILLA. [SEAL]

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

TWO EARLY PROPOSALS FOR NAVAL EDUCATION.

By WILLIAM O. STEVENS.

The notion that the only education necessary for a seafaring man was what he picked up aboard ship operated for a long while to prevent the founding of a naval school in this country, but the following are two noteworthy examples of the opposite view. The first is a plan provided for by the will of Sir Isaac Coffin, R. N., and while it amounted to nothing as far as our naval policy was concerned, it is interesting as a proposal for the establishment of three nautical schools made as early as the twenties.

I.

Sir Isaac was born in Boston in 1759. His father was collector of the port, and when trouble broke out in the colonies, proved himself a staunch Tory. In 1773 young Isaac became a midshipman in His Majesty's navy, and throughout the Revolution he fought for the King. He was with Rodney and Hood in the famous "Battle of the Saints" in 1782, and so distinguished himself in the eyes of Hood that he was rapidly promoted. In 1802 he became vice-admiral, in 1804 a baronet, and in 1814 admiral. Oddly enough, in spite of his Tory views and his brilliant career in the British Navy, he seemed to retain a positive affection for his rebel countrymen. Up to the very end of his long life he was interested in trying to benefit what he always called "my native land." He sent over English race horses to improve the American breeds and stocked American waters with British fish. He experimented with transplanting trees and shrubs that he thought might take kindly to the American climate, and presented maps and marine inventions to various seaport towns in New England.

He also made a will in which he devoted his entire fortune to the establishment of three naval schools in Massachusetts. In

fact, when the King named Sir Isaac in his list of new peers to be created for the passage of the Reform Bill in 1832, the Ministry objected on the ground of his too strong attachment to America, and in consequence he never became a lord. The following excerpts are from the will mentioned above:

Holding in grateful remembrance the manifold blessings I have derived from the principles instilled into me while at Boston, in the state of Massachusetts, the place of my nativity, and feeling that my success in this life is mainly to be attributed to the excellent education I received at that place . . . I give and bequeath all the personal property of which I may be possessed . . . for the establishment of three schools for naval education. One at said Boston, one at Nantucket, in state of Massachusetts, and one at said Newburyport. And for the purpose of maintaining and perpetuating such establishment I do appoint five visitors or overseers of said trust, that is to say whoever shall be for the time being successively the governor of said state of Massachusetts, the president of Harvard University at Cambridge of said state, and mayor of said city of Boston, with two others to be chosen by said three.

I will and direct that each of said schools shall be on the following plan and foundation, viz., each to be called "Sir Isaac Coffin's School." One of such schools being the first established to be at Boston in such a situation that the scholars may be near the waterside, and have ready access to the harbor, the school to consist of twenty-four scholars, twelve of them—if so many may be found—are to be the male descendants deriving their descent through males of the said Tristram Coffin, Sir Isaac's father and said Peter Coffin his uncle respectively, or one of them, and to bear, or before entrance to the school to take and assume the name of Coffin. And I direct that three masters be appointed for each school, namely, a master of a ship, a mathematics master, and a drawing master. . . . And I direct that the remaining twelve boys of the school at Boston shall be selected from the sons of industrious and honest inhabitants of Boston who may be desirous of bringing up their sons for a nautical life. And it is further my will that the sons of the poorest citizens be preferred. No boy shall be eligible who shall . . . not be of sound constitution, and no boy shall be admitted until he shall have attained the age of fourteen years, and that each boy shall be able to read and also to write a regular hand and have a competent knowledge of arithmetic and of the Christian persuasion. . . . Each boy shall leave the school at the age of eighteen, and I direct that the ship master, mathematics master, and drawing master should respectively be native citizens of Massachusetts. . . . And I direct that for each of the said schools a sloop of fifty tons, coppered and copper fastened shall be built or provided at the expense of the establishment, combining strength, convenience, fast sailing, and durability . . . and that the scholars of the Boston foundation shall be exercised in cruising in Massachusetts Bay and the neighboring coast, from the tenth of May to the tenth of September of each year, by which means they will become excellent pilots; and they are to survey all harbors

from Passamaquoddy to Nantucket, and to trawl and dredge on every part of the coast and on all occasions to try to discover the treasures of the deep, and to keep an accurate journal of their proceedings. . . . And by keeping body and mind in constant activity they will prepare themselves for the arduous career instant to the life of a seaman. And they are not to lose any opportunity of making astronomical and nautical observations; the sloop to be caulked and kept in repair in sails, rigging, and hull, by the personal labor of the master and scholars, and to be called the "Seaman's Hope," carrying a white flag with a pine tree in the center. And I direct that the boys in the two first classes of this establishment shall be exercised two years on the sloop of such establishment prior to leaving school. And I direct that the sloop belonging to the Nantucket school shall cruise from Cape Cod one way to New York, the other way trawling and dredging assiduously as the ground will admit, since I conceive that many oyster beds may be discovered in Long Island Sound and between Montauk Point and Sandy Hook. . . . And I direct that each of the scholars shall learn to swim, and each acquire a knowledge of the following trades or callings, that is to say, ship-building, caulking, rope-making, mast-making, block-making, boat-building, coopering, house-carpenter's and joiner's work, baking, blacksmith's work, cutting out and making clothes, knitting, making nets of all kinds, mixing up paint and painting, the art of cooking in all its branches, the art of slaughtering animals with due economy, also of preserving meat by pickling, salting, or smoking. I also direct that muskets be provided and kept up to belong to each school that the boys of the first class may be exercised by the ship master . . . in firing at a mark. . . . And I direct that the scholars be taught the use of the back sword, the art of gunnery and of fire-lock exercise, and to be at liberty to amuse themselves at proper times with athletic games, such as cricket, football and wrestling. . . .

I wish the boys to be in every respect as well qualified in mathematical and astronomical knowledge as the scholars at the Naval College at Portsmouth in England are qualified. And I will direct that each mathematical master, in addition to his other qualifications, shall be competent to give lectures on the several heads of natural philosophy; namely, pneumatics, hydraulics, optics, mechanics, electricity, astronomy, geology, geography, with the use of globes, and that a philosophical apparatus be provided at the expense of each establishment. . . . I direct also that models of a ship, brig, snow, schooner and sloop be provided in each school, and that the boys be practised in rigging and rerigging the same during the winter.

And it is my direction that the ship master of each school shall be thirty years of age before he shall be qualified to conduct the affairs of the establishment, and shall not be eligible after forty-five years; and he may, if he think fit, or be required by the trustees, retired at any time after the age of sixty years . . . with an annuity of £50 for his life, the drawing master . . . with an annuity for his life of £40.

For some reason, Sir Isaac changed his mind and cancelled the will. He gave the original to one of his American friends, and

it found its way to print years afterwards in an issue of the *Southern Literary Messenger*. He did not, however, abandon his plan entirely. In 1826 he gave a thousand pounds to found a "Sir Isaac Coffin School" at Nantucket, largely for the benefit of the descendants of his father, Tristram, who had been one of the ten original purchasers of the island. At that time there was no public school in Nantucket, and a very large proportion of Sir Isaac's relatives were still living there. As a part of this institution he bought and fitted out a schooner to be used in training the boys to follow the sea, so that eventually he did provide a nautical education for the youths of Nantucket. After a varied career this "Sir Isaac Coffin School" is still maintained on the island, and though the nautical end has been dropped long since, it perpetuates the benevolent old Tory's practical ideas by being to-day a manual training school.

II.

Strictly speaking, the schools designed by Sir Isaac Coffin were intended more to develop a skilled merchant marine than a navy, though he evidently had in mind the Portsmouth Naval College as his standard. The second proposal was aimed directly at the education of officers in the American Navy, and it was the interest aroused in the country by the latter that brought into print the earlier one for comparison.

While a batch of midshipmen were being examined for promotion, late in the twenties, one of the young men was questioned as to the lunar problem. Instead of repeating the Bowditch formulas, after immemorial custom, he had the audacity to step to the blackboard and work out the question as a problem in spherical trigonometry. The "Professor of Mathematics" conducting the examination got lost in trying to follow him, and brazenly declared the demonstration wrong. The midshipman insisted. The officers of the examining board, knowing still less than the schoolmaster, decided after an embarrassed consultation, to support him on general principles. Accordingly, they looked as wise as possible, informed the midshipman that he was all wrong and bade him to go to sea again and learn his business.

Under this decision, Matthew Fontaine Maury lost two years in promotion. And this was the boy who taught himself the theory of navigation, aided only by a Spanish textbook and a dictionary,

who used to chalk diagrams of problems in spherical trigonometry on the round shot in the quarter-deck racks to solve while standing watch, and who, at the time of this absurd examination, had ready for publication a set of lunar tables of his own! A few years later, while he was still a passed midshipman, he published his "Navigation," which met with immediate success in England and America, and was adopted as the textbook for the Naval Academy when it was founded in 1845.

The experience which cost the brilliant young mathematician two years in his grade was not likely to imbue him with respect for the system which made it possible. In 1839 he was thrown from the top of a stage coach and seriously injured. During his convalescence he began contributing to the *Southern Literary Messenger* a series of papers on the navy under the caption "Scraps from a Lucky Bag," signed by "Harry Bluff, U. S. N." Three of these "Scraps" appeared in 1840, and two in the following year. In these articles he exposed the inadequacy, both in matériel and personnel, of the navy in his day, and the paralyzing influence of political corruption.

These "Scraps from a Lucky Bag" produced a sensation. Without knowing who "Harry Bluff" was, the officers of the navy subscribed to having the articles reprinted in pamphlet form and scattering them broadcast in order to educate the country to the needs of the navy. The "Navy Board" was trapped into a disastrous one-sided controversy with Maury; Congress was called upon to investigate and explain, and undoubtedly several reforms were inaugurated as a direct consequence. The most notable achievement resulted from his plea for a naval school, from which the following passages are taken:

> Now and then a feeble effort has been made with a view of introducing some system of education in the navy, but every such effort has proved abortive. The plan of furnishing schoolmasters to ships setting out on a three years' cruise was tried, but, no useful result accruing in many years, that plan was condemned by all in the service. Without considering that the defect was in the system not in the *name*, an attempt was made to improve the education of the young officers by changing the title of the teacher. The title of schoolmaster was exchanged for that of professor of mathematics, but his duties and authority remained the same. To this day there is not a work that has been assigned as textbook for the navy. The teacher has no authority over the pupil, nor can he claim attendance or attention of the latter in the schoolroom or to any particular study. The whole plan is without order.

Under the present arrangement the duties of a schoolroom, when one can be found on board a man of war, are subordinate to every other on the ship. There the midshipman is taught to consider his attendance at school as the matter of the least importance in his routine of duties. He is interrupted in his lessons to go ashore for the captain's pig, or he is called from recitation to count the duck frocks and trousers contained in the wardrobe of Tom Brown, the sailor. I have known a captain who forbade the midshipmen to "work out longitude" on the ground that it was a secret of the captain and the master, and therefore exceedingly officious and unbecoming the character of gentlemen for midshipmen to be prying into the rate and error of the chronometer, or to have anything to do with longitude. It is considered by no means discreditable for the midshipmen never to be seen in the schoolroom, and many make it a matter of pride never to be seen there. Every officer is so fully convinced of the futility of trying to teach midshipmen under the present arrangements that there is no one to take any interest in the matter. Even the professors themselves, when they come to understand the difficulties in their way, "go through the motions" of their duty for form's sake, conscious that they labor in vain.

Among all the officers of the navy in the line, from the youngest midshipman to the senior post captain, I know of but one who has taken a degree in any college or institution of learning in the United States. . . . While some of the best treatises on the subject to which they relate have for their authors officers of the army, the navy is remarkably barren in professional works. From the first establishment of the navy up to the present time, no scientific or professional work of any kind (if we make exception of one work only [Maury's own Navigation]) has been produced by any officer in it. The reason is obvious, the officers of the army have the benefit of a professional education. . . .

I would set apart one of the idle ships in the navy as a schoolship. . . . On board of that ship the duties of the school should be paramount to all others, that is, she should be first a schoolship and then a man of war. Every officer on board, purser, chaplain, master, surgeon, lieutenant, and commander, every one should have a chair assigned to him and take part in the duties and management of the school. The captain should be tactician and *ex-officio* the president. Him I would hold responsible . . . for the proper management of the school. . . . The chaplain should instruct in languages, the purser in gymnastics, the master in drawing and naval architecture, the surgeon in chemistry and natural history, and the lieutenant in mathematics, astronomy, natural philosophy, navigation, etc.

I have assigned languages to the chaplain because his clerical character presupposes him learned in the dead languages but I would have none of them; the useful, practical, living languages I advocate. First, that most difficult, arbitrary, and useful of all languages, the English; and after that your French, or German, or Spanish.

If the grade of purser contained no one skilled in fencing or gymnastics, to fill such a chair, let it, with a purser's commission be tendered to some one ably competent in civil life. I would make a similar tender of a master's commission to a naval architect and draftsman.

The $20,000 annually wasted under the present system of professors of mathematics in the navy, if added to the pay as navy officers of the professors of the schoolship, would make the salary of these more than sufficient to command for the faculty the best talents the country can afford. Every professor should be a regularly commissioned officer of the navy, thus placing him under military law . . . identifying him with the service, the more effectually to secure his interest in the school, and the more surely to enable him to impart the proper esprit de corps to his pupils. . . .

It is an important item in the economy of the schoolship arrangement that no branch of science should, *ex officio*, attach to any particular grade. As professors they should all be equal, one chair should be as important as another. . . . But as officers of the ship each should enjoy his appropriate rank. . . .

If the schoolship were to cruise at sea two months in every year, the scholastic term might be extended to four years; after which a cruise of two years at sea should entitle the graduate to an examination in seamanship alone; on which, if found qualified, he should be passed and promoted. Under such a system you would see the service invigorated with young officers. . . . You would no longer see gray-headed midshipmen, or superannuated grandpapas for young officers.

In this age of discovery, invention, and improvement, it is no longer a matter of choice whether the rising generation of our navy officers shall be properly educated or not. It will not do now for the navigator, when asked to point out the place of his ship at sea, to slap his outstretched hand down upon the chart and say "*there.*" His place on that chart is a point and as such he must designate and mark it. . . .

When the Naval Academy was founded, four years after the publication of these articles, Maury's proposal for a schoolship was abandoned in favor of an institution on shore. Yet several of his ideas came to be incorporated in the new plan, as, for example, the four years' scholastic course, the two months' summer cruise, and the two years' cruise after graduation. And the biographers of Maury, in speaking of the naval reforms accomplished by the "Scraps from a Lucky Bag," make special mention of the Naval Academy as one of them.

Perhaps, in view of the work of Bancroft and others, it might seem unfair to refer to Maury as the "Father of the Naval Academy"; but in the sense of preparing the way by calling the country's attention to the need of a naval school, and creating a sentiment for it in the face of indifference and prejudice, the famous hydrographer deserves that title.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE POSTGRADUATE DEPARTMENT OF THE NAVAL ACADEMY.*

By COMMANDER REGINALD R. BELKNAP, U. S. Navy.

In explaining the intended operation of the General Order establishing a Postgraduate Department at the Naval Academy, a brief statement of the causes that led to it will help to a clearer understanding, especially on the part of those who are not familiar with the changes that have recently taken place in the Naval Academy course of study.

Graduates of the Academy of date prior to the Spanish War had a very different experience from those who came after. Close on the war followed amalgamation of the engineers with the line. Next, the practice of holding the final examinations at Annapolis was abandoned; and the pressure for more officers necessitated, first, that every one who could be graduated should be—with the inevitable result of a lowered standard—and then that the time spent at the Academy should be curtailed. In 1903 the number of midshipmen was doubled, but it was impossible to provide instructors in the same proportion or as experienced as before, or to keep officers at the Academy with the same regularity of service. Thus, more subjects had to be taught, in less time, to a larger body, by relatively few and inexperienced instructors; and to crown all, during this time of scholastic upheaval the reconstruction of the Academy buildings and grounds was in progress.

A situation so unfavorable to discipline and study might easily have been demoralizing. The severest critic, however, could but admire the spirit with which the conditions were met; and the

*As originally written, this was delivered as a lecture at the Naval Academy.

results achieved reflect great credit upon the administration of the Naval Academy and all who served there. But naturally that thoroughness which had been a most distinctive feature of Naval Academy instruction fell off to a marked degree; and by the time administrative conditions began to mend, scarcity of officers in the service had imposed upon the youngest ones duties far beyond their experience, and in the endeavor to equip them for these, further additions were made to the academic course, which hindered the restoration of the former standard. To remedy the situation, the Wainwright Board was appointed in 1907, and suggestions were freely invited from officers of the service. Much good resulted; but still, in the consensus of opinion, the Naval Academy course was not right. One question, common to many minds, often found expression: "What is the matter with the Naval Academy?"

Admittedly, the fault at bottom was the attempt to cover too much ground in four years. Much that was essential to a general education had been so crowded in, if not crowded out altogether, as to be little recognizable afterwards; while subjects had been squeezed in that would be of no service to an officer for many years to come. The true function of the Naval Academy, to train *ensigns*, had been exceeded in the endeavor to make lieutenants. Doubtless a division into undergraduate and postgraduate studies must have been often considered, but such a plan appears to have been less generally favored than a change to a five-year course. Without going into the merits of that, it is worthy of note in passing that no other navy * has even a four-year academic course for its midshipmen before getting them into the thick of things afloat.

At the beginning of this year, 1912, the situation demanded a change, and events soon favored making some. The first made was a new form of summer practice cruise for the first and second classes. Good results from using three battleships for the midshipmen during the previous two years gave promise of still better results from sending a few midshipmen of each class (first and second) to each battleship in the Atlantic Fleet for the summer; and this was accordingly arranged. It was expected that the

* In England, two years are spent at Dartmouth, two at Osborne, before going to sea; but the Dartmouth course compares with a preparatory school.

midshipmen's two-year cruise after graduation would be abolished during the current session of Congress, and such an Act did pass, on March 7, 1912; so that, since the midshipmen would become commissioned officers immediately on graduation, it was imperative to revise the whole course of study, and in doing so to include the new practice cruise system as a permanent feature, to the end that the young officers might enter on their first regular sea duty better prepared, and with more confidence, than would be possible if their previous sea experience had been only in the artificial routine of a school-ship.

In changing the Academy course, the principal aim for the first year, or fourth class, was to round out and strengthen the foundation which is supposed to be established prior to admission. Candidates come from all over the country and from many kinds of schools, whose character and method of instruction vary widely. There is wide variation also in age among the members of a class; and despite all efforts to the contrary there will always be a considerable number entering who have passed the examination by cramming but are not well prepared, and yet may often be desirable material to develop for the navy. The first year will therefore make sure of a certain definite groundwork, by reviewing and fixing the elements of it at the Academy. This may make the first year's work easy, perhaps, for the older and better prepared members of the fourth class; but even to them such a course will be valuable, in forming habits of method, accuracy, thoroughness, and rapidity, to a degree not commonly acquired at schools outside.

Moreover, the Academy requirements are more severe in rapidity and accuracy than those of the average school; and when, in addition to these, the newly entered midshipmen encounter sudden or rapid advance in studies, the younger ones and those imperfectly prepared find the task too much, and drop out at the first semiannual examination. That there is good material in many of those who fail on a first trial is shown by their reentering with the next class and completing the course successfully—thereby becoming officers one year later, one year older, and with a loss of that time to themselves and of nearly a year's extra outlay to the government. It is more than probable that placing the requirements too high in the first term, when everything is new, has been the cause of losing valuable material, especially among the younger

ones, who as a class should be the most desirable for the service. With the first-term work now so modified as to increase the requirements more gradually we may look for fewer failures.

Room has been made in the new curriculum for more English, to which not enough time had been given. Too much dependence had been placed upon work done before entering. A schoolboy knowledge of general history, and a hasty acquaintance with rhetoric, logic, and the classics, English and American, could not give the well-balanced education which the Naval Academy graduate is expected to have; and limiting the study of naval history to American naval history alone tended to give false impressions and narrow views of important naval principles. The English and History course is accordingly prolonged and enlarged by the inclusion of grammar, syntax, and composition—usually none too well acquired before entrance. General history and American history, formerly in the course, have been restored to it, and *general* naval history added. Needless to say, it is most important in the early training of naval officers to inculcate a taste for reading history and travel, especially naval and military history and biography.

General history being added to the academic course, it has been eliminated from the entrance examination. Candidates may now devote themselves solely to United States history, English, and geography, and it is hoped that they will come better prepared in those subjects. No other change in the entrance examinations has been made, except to allow more time for them.

In modern languages, the course is now extended throughout every term of the four years, with a view to holding all that may be learned in the first years of the course. By this means, and combining the Berlitz system with some instruction in grammar, it is expected that the graduates hereafter may be able to *express themselves* in Spanish and be fairly well grounded in French.

The course in mathematics and mechanics has been little changed. Plane geometry has been restored to the fourth class year, as a review of an entrance examination subject.

So much for the general educational features. On the professional side, the abolition of the two-year cruise involves an increase of the instruction to be given in seamanship, navigation, engineering, electricity, and gunnery during the four years. But the practical training lost with the two-year cruise will be largely made up by the better training during the new first and second class prac-

tice cruises. The general scheme for those cruises is: engineer duties in the second class cruise; deck, battery, and navigation duties in the first class cruise. In preparation for them, preliminary instruction in marine engineering and electricity will be given in the second term of the third class year; and in the second class year the academic instruction in navigation will prepare the coming first classmen to take advantage of opportunities in practical navigation during their summer in the fleet. The small number of midshipmen on board each ship will permit each one to have more experience and individual attention than before, and the whole time will be spent in regular service under normal conditions, such as to impress upon them a sense of their being officers with responsibilities, and encourage those of good practical aptitude but only average scholastic ability to work for higher standing than they could attain by studies alone.

In order to gain the additional allotments of time and to adhere to the determined distinction between academic and postgraduate spheres of instruction, the scope of professional instruction at the Academy has been limited to that which is essential to qualify the midshipmen for the duties of ensign, making no attempt to fit them for the grade of lieutenant or for any of the specialties of the navy. The professional subjects abridged by the elimination of features not essential to the general duties of ensigns are:

Battle tactics, tactical problems, scouting, chasing, patroling, intercepting.
International law, the instruction being made elementary.
The more theoretical features of navigation and compass work, derivation of formulæ, etc.
Mechanical drawing.
Mechanical processes and metallurgy.
Experimental engineering.
Boiler, machinery, and electrical designing.
Steel ship building.
Mechanics and applied mechanics.

The key-note of the revision is extension of postgraduate work. The studies appropriate for specialists and for higher duties than those of ensign must be acquired in postgraduate courses, or else by the officer himself in the course of his service experience. His qualification in the latter case will be tested by the examinations for promotion. This simplification facilitates concentration of effort on the formation of officer-like character. In their subsequent development as naval officers, much depends upon the mid-

shipmen's military training in their early, most impressionable years. In the words of a former superintendent, "We must remember that the Naval Academy is the nursery of the Navy, and whatever you produce there will be ultimately felt in every branch of the service; among enlisted men and elsewhere." The purpose of the Naval Academy is to graduate naval officers of military instincts and training. The aim of the four years' course must be to turn out young ensigns of a uniformly high professional quality. Afterwards, in the service and by postgraduate instruction, secure the broader development.

Postgraduate instruction was first established on a regular basis in pursuance of a joint report to Secretary Moody, which he approved, made by the Chiefs of the Bureaus of Navigation, Steam Engineering, and Ordnance, Rear-Admirals H. C. Taylor, C. W. Rae, and G. A. Converse, respectively.

The substance of their report reads as follows:

We find that the demands for scientific expertness, in matters that concern the supply of ordnance material, grow more imperative as time goes on. The manufacture of smokeless powder requires a knowledge of practical and scientific chemistry; the inspection of steel for our guns and armor calls for expertness in metallurgy; and the problems constantly presenting themselves relating to sights for guns, their mounts, and the peculiarities of their action, in turrets and elsewhere, necessitate an intimate knowledge of mathematical and mechanical principles that can be acquired only by periods of practice and special study.

The same is true in everything relating to the design, inspection, construction, and handling of the engines, boilers, and other machinery connected with the engineering department of our vessels.

We recommend, therefore, that four midshipmen who have completed their two years at sea shall be ordered, each year, to instruction in ordnance for one year, and four other midshipmen shall be ordered for similar duty under the Bureau of Steam Engineering, for the same period. Following this year of instruction, these midshipmen shall have the customary cruise of two or three years in length; they shall then serve two years more under instruction in ordnance and in steam engineering; and thereafter, following each cruise, shall have not less than two years' detail in ordnance and engineering work.

So far as practicable, these officers shall be selected from midshipmen who are likely to prove proficient in these branches of the service, and shall be taken, as a rule, from different portions of each class, so that they shall not all be from the upper or from the lower part.

To provide for present needs, and until these officers to be annually detailed shall be available, we respectfully recommend that orders be issued,

as soon as practicable, for eight officers of the rank of junior lieutenant and ensign to report to the Chief of Bureau of Ordnance, and a like number of officers of the same rank to report to the Chief of Bureau of Steam Engineering.

At the beginning of the next year, five officers began the first ordnance class. The Chief of Bureau of Ordnance, then Rear-Admiral N. E. Mason, instructed them as to what was expected of them, in a letter dated in December, 1904, as follows:

This Bureau having selected you for detail to special ordnance duty, and the Department having approved the selection and assigned you to such duty, it is considered desirable at the beginning of your career as an ordnance officer to acquaint you with the views of the Bureau as to the scope of your work during your present and future assignments to ordnance duty.

A board of officers appointed by the Secretary of the Navy to devise a system which should meet the demands of the service for officers specially equipped for the technical work of ordnance, recommended that a certain number of young officers be detailed each year for a course of ordnance duty and instruction, and that they be allowed at least one year of shore duty on their first detail and at least two years on subsequent details.

It is upon this recommendation that the Department has acted in assigning you to ordnance duty. You will note that it is not proposed to form a new corps outside of the line of the navy, but merely to provide opportunities for a certain number of officers *within the line*, to specialize in ordnance work, it being recognized that such specialization calls for longer periods of shore duty than would naturally fall to the share of the same officers under other conditions.

The plan contemplates also the utilization of the services of these officers, when on sea duty, for such ordnance work as may be appropriate to their rank and experience; but it must not be supposed that such duty can be claimed as a right, or that officers who have qualified as ordnance experts will not be expected to maintain a high standard of proficiency in other branches of their profession.

It is proposed that your coming tour of shore duty shall be divided between the Bureau, the Gun Factory, and the Proving Ground, but it is hoped also to employ you from time to time in connection with the manufacture and inspection of material, thus affording you opportunities to visit the various manufacturing establishments which are doing work for the Bureau.

As it is neither practicable nor desirable to assign officers for your instruction, the work which you accomplish and the benefit which you receive will depend largely upon your own energy and initiative. The Bureau will, however, assign one or more officers to exercise a supervision of your work and to suggest in a general way the lines which it is to follow.

Looking beyond the period of shore duty upon which you are now entering, it is assumed that while at sea you will regard yourself as retaining

a connection with the Bureau, not only when formally assigned to ordnance duty, but at all times, taking advantage of every opportunity to extend your knowledge on ordnance matters, keeping notes and making reports of all matters of interest observed.

Your sea duty will afford you opportunities to watch the practical operation on shipboard of the material in whose design or test you may have borne a part, and to keep in touch with the changes and the needs of the service. It will also continue your general professional education and your training for the responsible duties of command.

Your assignment to the present duty marks a departure in the policy of the Department, which is in a great measure experimental. Its success will depend largely upon the zeal and intelligence with which the duty is approached by the officers who have been selected to inaugurate it.

A second class of five followed in 1905, four in 1906, and two in 1907. None were ordered in 1908, on account of the long foreign cruise of the fleet; but ten were ordered the next year to make up, four in 1910, and five in 1911, making in all thirty-five in eight years.

A year and a half elapsed, however, after the joint recommendation of the three Bureaus before the engineering instruction was begun. Then eleven officers were selected, who began their work in January, 1906. The Engineer-in-Chief's letter of instructions to these officers, written in May, 1905, after quoting the joint recommendation, stated the views of the Bureau of Steam Engineering as follows:

It is in accordance with this recommendation that the Department has acted in assigning you to duty for special instruction in steam engineering. You will note that it is merely to provide opportunities for a certain number of officers within the line to specialize in steam engineering work, it being recognized that such specialization calls for longer periods of shore duty than would naturally fall to the share of the same officers under other conditions.

The Bureau has issued instructions to the senior officer doing engineering duty at the station to which you have been assigned to provide you with necessary office room and all possible facilities for acquiring information, and also to supervise your work and direct you as to what course he thinks proper for you to pursue to meet its views. You must bear in mind at all times that the benefit you will receive from this special course, also the duration of this system, which is now experimental, will depend entirely upon yourself, your zeal, energy, and application.

You are directed to keep daily notes of the work you have been engaged upon, and to make at the end of each month a report to the senior engineer officer present of the nature and progress of the work done; this work will be forwarded to the Bureau.

The Bureau will, from time to time, request your temporary detail to witness such tests and trials of machinery or mechanical devices as it may consider to be of advantage to you.

Although you are to make a specialty of engineering, the Department expects you to keep yourself well informed in the general duties of your profession. You will therefore, when assigned to engineering duty on board ship, keep in touch with those other duties which lead to command; and when assigned to those other duties, keep in touch with engineering matters, as there are few positions assigned to line officers on board a modern vessel of war where a knowledge of engineering is not a requisite as well as a benefit.

In becoming a specialist you assume grave responsibilities, which will necessitate hard work on your part, as in addition to the ordinary requirements of your calling, you will be called upon for professional opinions on matters which heretofore have been the province of officers devoting their whole time and attention to this subject alone. You will therefore realize that the Department demands much of you, and you will not assume the detail without proper consideration. Upon you, and your colleagues similarly assigned, depends the success, or the failure, of the assumption of engineering duty in the line of the navy.

A second engineering class, of four officers, took up the course in 1907, but in 1908 none were ordered, on account of the fleet cruise. Generally speaking, the results did not meet expectations, indicating that closer control and direction were needed; and an improved system was put into effect by the establishment of the School of Marine Engineering at Annapolis, by General Order No. 27, of June 9, 1909. An extract from this order indicating the scope of instruction reads:

. . . The Superintendent . . . will establish regulations, subject to the approval of the Department, that will secure ample use of the educational plant of the Naval Academy to students and instructors of the school without interfering with the instruction of midshipmen.

4. The Chief of the Bureau of Steam Engineering will issue such orders as will secure the use of the engineering experiment station at Annapolis by the school.

5. The course of instruction in the school will not exceed two years.

6. The Bureau of Steam Engineering will prepare and submit to the Bureau of Navigation, for the approval of the Department, a curriculum for the school. This will include, in part, the study of design of marine machinery at the Bureau of Steam Engineering; the study of shop practices and management at such private engineering establishments as may be willing to allow the facilities of their plant for this purpose; and of experimental engineering and testing machinery and other mechanical appliances.

7. Instructors while at the school . . . will not be connected with its academic work.

8. Ten line officers will be detailed annually to the course of instruction at the school.

9. Selection for this detail will be made by the Department from officers who are recommended for this duty and who request it. They must have performed not less than three years' service at sea, and except those selected for the first class, must be below the grade of lieutenant-commander. They will be selected on their records and reports of fitness, including letters from their commanding officers and from the engineer officers under whom they have served.

10. After completion of the course at the school of engineering, the student officers will, if practicable, be ordered to engineering duty on shore for a short time and then to engineering duty with the fleet.

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The order further contemplated that a body of twenty designing engineers would be built up, by selecting, from the nine or ten engineer specialists turned out yearly, not more than two a year, for permanent engineer duty throughout the remainder of their naval career.

Ten officers, in each of the years 1909, 1910, and 1911, have taken the engineering-school course, making, with the two early classes, forty-seven in all since engineering instruction was first put on foot eight years ago.

Besides the ordnance and engineering classes, officers selected for the corps of naval constructors and civil engineers have been sent, for three-year and two-year courses respectively, to the Massachusetts Institute of Technology, and the Rensselaer Polytechnic Institute at Troy. Further, the ordnance and engineering students have not been held within narrow limits, but have branched out; so that, through development of the original idea, there are already firmly established and officially recognized postgraduate courses in:

(a) Ordnance and gunnery, including the chemistry of explosives.
(b) Marine engineering, covering several specialties.
(c) Electrical engineering.
(d) Radio-telegraphy.
(e) Naval construction.
(f) Civil engineering.

There are, besides, other courses, at the War College, in torpedoes, in navigation and compass work, and in foreign languages; but these are of a different sort, not described by the term "postgraduate," in its common acceptation.

Such being the postgraduate situation, the moment is oppor-

tune for simultaneous revision of the midshipmen's course and reorganization of the postgraduate work, adjusting each one to the other, and both to the needs of the service. Quite plainly there is need for many more postgraduates than we have been turning out; and equally plainly, the good and improving work already done in these courses shows how much more valuable still it is easily possible to make them.

Hitherto each Bureau has managed the affairs of its own student officers; but with increased numbers in prospect, and a wider scope of work, a central administrative control becomes necessary for better and more systematic management and economy of effort and expenditure. Another requisite of the first importance is to dignify the postgraduate work throughout the service. This it is hoped to accomplish by placing it on a more prominent footing, closely connected in its management with the highest official authorities in the several branches, and by making the courses so valuable and interesting that not only will officers seek them, but captains will be glad to help their officers get them. This last may only come in time; but unity of effort through consolidation, wider usefulness, higher attainment, and increased prestige, should result forthwith from establishment of the Postgraduate Department. At the same time the Naval Academy itself, as an educational institution, is placed on a higher plane by the additional function entrusted to it.

The Naval Academy is the logical place for such a department. Its equipment for instructional purposes, the proximity of the Engineer Experiment Station, and the experience already had with the School of Marine Engineering, combine many advantages; but before all come the service spirit and improving influence of the Academic staff. As in a university, the undergraduates and the postgraduates will feel the stronger unity of interest for being together. The presence of student officers will incite the midshipmen to earnest work; and the student officers will feel their responsibility to set an example. The half-yearly influx of young enthusiasts fresh from the fleet will bring new light to bear on many points of instruction, and on the other hand the student officers will pick up the dropped threads again more readily among these familiar associations than they would in a place entirely new. They will constantly remind the Academy that it exists for the fleet; and the academic surround-

ings will in turn remind them that they have come to study. Thus the practical fleet and the preparatory Naval Academy will favorably react on each other.

The number of officers detailed to take postgraduate courses will be from time to time gradually increased, but not by any large number suddenly; nor is it proposed that all the members of a class shall take a course. That would be no more necessary than for every college graduate in civil life to go back for another degree. There are many other ways of naval specializing, and it would never be expected that all officers would specialize.

Courses will begin twice yearly. Selections for those beginning in October will usually be made in August or September, allowing time for the majority of a class coming up for junior lieutenant* (after 1914) to be examined before the final choice is made. The February course provides for others of the same class who may be late for examination or in returning from the Asiatic Station, or otherwise delayed. Selections will be made on the officers' records, the new form of fitness report furnishing ample information for that purpose and opportunity to apply for a course.

Considering now General Order No. 233, of October 31, 1912, establishing the Postgraduate Department, it will be seen that, as far as it is possible to confine its provisions, it is essentially an organizing order, on which the details of the system of postgraduate courses can be developed. The provisions of the order need little if any explanation, but some comment may serve to make their intent and working clearer.

GENERAL ORDER } NAVY DEPARTMENT,
No. 233. } WASHINGTON, D. C., *October 31, 1912.*

1. General Order No. 27 of June 9, 1909, and other general instructions governing special training courses for officers, in so far as any of their provisions may conflict with those following, are hereby superseded.

2. A Postgraduate Department is hereby established at the Naval Academy, separate from the academic departments and independent of the Academic Board. It shall be governed by an Executive Council for Postgraduate Courses, composed of the Superintendent of the Naval Academy, the head of the Postgraduate Department, the heads of the Academic Departments of Marine Engineering and Naval Construction, Ordnance and Gunnery, Electrical Engineering, Mathematics and Mechanics, and Physics and Chemistry, the head of the Engineering Experiment Station, a naval constructor, and a civil engineer.

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* Until after 1914, officers will be eligible for selection after three years at sea as midshipman and ensign together.

3. The Council will pass upon administrative questions and upon the merits of the student officers, and have advisory functions in matters of the curriculum. The Council will formulate its own rules for procedure, subject to the approval of the Bureau of Navigation, and shall submit to the Bureau of Navigation from time to time such recommendations affecting postgraduate courses as may seem advisable.

4. The head of the Postgraduate Department will be detailed by the Navy Department. He will direct and conduct the executive and administrative work connected with the postgraduate courses, replacing the head of the School of Marine Engineering. He will have the same general status as heads of academic departments, and occupy quarters in the Naval Academy of the same class as other heads of departments; but he will not be a member of the Academic Board nor have any duties in connection with midshipmen.

5. The curriculum for each postgraduate course and any changes in curriculum will be established by the Navy Department, on recommendation of the Bureau of Navigation and the Bureau most directly concerned. The facilities and equipment of the Naval Academy and of the Engineering Experiment Station, and the services of such professors and instructors of the Naval Academy as may be necessary and available, shall be at disposal for the purposes of the Postgraduate Department.

6. The curriculum for each postgraduate course in a technical branch will begin with a four months' term of study in theoretical and applied mathematics and mechanics, physics, chemistry, laboratory and experimental work, mechanical drawing, principles of industrial management, and those special studies for each branch which are the ones that should be taken up first. The work will be laid out definitely in each study, and the student officers required to follow the schedule. Each study shall be under the general direction of the head of the appropriate Academic Department, and the student officers shall always have access to such head, or to some professor or instructor designated by him, for guidance and assistance. Examinations shall be held at such intervals and of such nature as may be found most productive of good results, to test the application, industry, and progress of the student officers. At the close of the first term of four months a thorough examination will be held upon the ground covered, which, together with the work accomplished during the term, will determine the relative merit of the student officers. The purpose of the first term's closely regulated and directed work is to refresh and strengthen the theoretical knowledge previously acquired by the student officers, train them to method in investigation and experiment, and help them to regain the habit of study and reading—all this as necessary preparation for pursuing a chosen branch of specialized study.

7. The second four months will be spent at Annapolis, continuing such work of the first term as may be specified, or elsewhere at governmental or private establishments, or both, in such occupation as required by the curriculum; but the same direction and guidance of each student officer's work, and the same touch with his progress, will continue as in the first term, as far as different circumstances permit. At the close of the second

term, the relative merit of the student officers will be determined the same as at the end of the first term.

8. After the close of the second term, the student officers whose progress has not been satisfactory will be dropped from the postgraduate course upon recommendation of the Executive Council, and will be ordered to sea duty.

9. Following the first eight months' work, the student officers will pursue such course of study and investigation as the special curriculum may require or permit. The courses shall be definite and under such control as to enable the head of the Postgraduate Department to keep fully informed of the employment and progress of each student officer. At the same time, these postgraduate courses shall not be confined to the beaten track only, but, on the contrary, work along original or useful new lines is encouraged. The normal period for the postgraduate course will be altogether two years; but in special cases recommended by the Executive Council an extension of time may be authorized, and the two-year limitation shall not apply to courses whose main part consists of a standard course pursued at outside educational institutions.

10. At the conclusion of the second year the student officers will be examined on their work accomplished, as shown by theses, reports, data on investigations and experimentation, and other appropriate tests. The cooperation of civilian professors and experts will be sought in establishing suitable standards by which to pass judgment in the various lines of postgraduate work pursued, and the student officers will be given graded certificates accordingly. These certificates will be noted in the officers' records, and appropriately noted also in the Navy Register against their names; and they will be a guide in the assignment of the officers concerned to duty.

11. Officers detailed to postgraduate courses beginning after October, 1912, will be selected, upon the recommendation of the Bureaus respectively concerned, from those who apply and are recommended in their reports of fitness for the postgraduate course, provided they have completed not less than three years' sea service, and, if then eligible by law, have qualified for promotion to lieutenant, junior grade. The great majority will be selected from those who have just completed three years' sea service (and after 1914 passed for lieutenant, junior grade), but officers of considerably longer service are equally eligible. Officers for the corps of naval constructors and civil engineers will be selected after approximately one and one-half years' sea service after graduation; and those from the class of 1911 will begin their course in February, 1913. The form for reports on fitness now provides for applications and recommendations for postgraduate courses, so that special letters of application are no longer necessary. Inasmuch as the new forms have only recently been issued, applications for the course to begin on February 1, 1913, will be received until December 31, 1912. These details will be made twice yearly, the classes to begin the first-term work at Annapolis on or about October first and February first, respectively.

12. Postgraduate courses begun in October, 1912, will be established

under the provisions of this order in Ordnance and Gunnery, Marine Engineering, Electrical Engineering, Radio-Telegraphy, Naval Construction, and Civil Engineering. As soon as the main features shall have been decided upon, a schedule will be published giving an outline of the courses in the various branches of specialization under the general heads named, and showing which courses are to begin with the October term, which with the February term, and stating the educational and other institutions, governmental and private, at which the courses, in the main or in part, will be pursued. The administration and regulation of such of the courses named in this order as are already established will be taken over by the authorities herein constituted as soon as practicable.

13. Student officers at Annapolis will be subject in military regard to the Superintendent of the Naval Academy; but they will not be assigned quarters in the Naval Academy, nor shall they be ordered to any duty unconnected with their courses of study. Elsewhere than at Annapolis they will be subordinate to the commandant of the navy yard or station or other local senior officer.

G. v. L. MEYER,
Secretary of the Navy.

The Executive Council is composed of the highest official educational authorities that the organization of the navy provides in the branches concerned. It is a body similar to the Academic Board, but acts more in an advisory capacity and has not finality of decision. Many recommendations concerning the curricula will doubtless come from it; and the Council will render inestimable service in getting the courses soon definitely developed along the several lines most profitable for the respective specialties. Paragraph 9 says that "the courses shall be definite . . . at the same time not confined to the beaten track only, but, on the contrary, work along original or useful new lines is encouraged," meaning that, within reasonable limits, the student officers will pursue the lines for which they are respectively best adapted. To permit this, the Council should soon be in position to point out the best course for each one to follow. In this respect lies the principal difference between the former system and the one now in process of establishment. By the former system, the student officer was left much to his own devices. Advice was given, assistance, suggestions, encouragement; but it can hardly be said that there was any strong and steady impelling force along well-defined lines, or any definite goal. Under the new system there will be equal freedom in choosing a specialty, but the work is to be mapped out to such extent that the student officer will never lag nor hesitate for not knowing what next to do; and at points where

choice can be made of several lines, the Council must be ready with sure guidance as to whither each one leads, and their relative advantages. Furthermore, it must be determined in what parts of every course a tight rein must be held, and in what other parts to allow free rein. The time allotted the students is a dead loss if they fail to profit by their opportunities. The value to the service is proportional to their accomplishment. No time to spare, then, for sounding out the channels; the student must find them well buoyed. It is easy to see what a responsible rôle this of the Council's will be; how interesting; how it must lead to frequent contact with prominent educators and experts in civil life; and how the broadening influence of the postgraduate work will react beneficially on the Naval Academy as well. It is an inspiring task, and the service will be lastingly indebted to those who undertake it with success.

Another function of the Council will be the passing upon the merits of the student officers. Much depends upon this. A high grading too easily obtainable will lower the courses in general esteem, and tend towards decreased efficiency; while a too difficult standard will arouse a sense of injustice, and spread a feeling that the courses have become too academic, too theoretical, and—worst reproach of all—"*not practical.*" We must never swerve from the purpose to improve our officers' technical equipment, nor forget that we are seeking outside knowledge not for its own sake but for its value to the navy.

The function of the head of the Postgraduate Department is executive and administrative, and we may expect to see this office grow in importance as the number of students increases and the system becomes generally recognized as a permanent institution.

In establishing the several curricula, the usual procedure will probably be: first, the Bureau concerned to state its requirements and how it desires to have them met; second, this statement, with the concurrence of the Bureau of Navigation and the Secretary's approval, to go to the Council; third, the members of the Council concerned will arrange the details conformably, which, as adopted by the Council, will go back for final approval by the Bureau concerned and the Bureau of Navigation and the Secretary, and return to the Council to be put into effect. With easy communication between Annapolis and Washington, and convenient personal conference, matters of this kind should always be satisfactorily settled in short order.

Paragraph 12 names the general heads under which there will be courses; and each head may cover several specialties, as the need for them develops from time to time. Thus, under Ordnance and Gunnery, there may be specializing in:

Gun design and construction.
Gun mount design and construction.
Chemistry of explosives.
Torpedoes.
Armor.
Optics, etc.

In Marine Engineering, there may be specializing in:

Turbine machinery.
Gas engines.
Boilers.
Fuels, etc.

In making out the curricula, it is far from being the intention to abolish or disturb outside instruction courses that are already in satisfactory operation. On the contrary, many more such courses will be adopted. But it is intended to start all future students with a preliminary course at Annapolis, mainly theoretical, to break them in again to studious habits, and help develop the mental facility necessary to get the most out of their special opportunities. Thus, existing courses for naval constructors at Boston, and for civil engineers at Troy, will be continued as before; but it is proposed that hereafter more will be selected for these courses than the number of vacancies would require. All of those selected would begin in February, taking four months at Annapolis, and then four months at a navy yard. At the end of eight months a second selection among them would be made, picking the most promising ones to take the courses at Boston and Troy. Those remaining would either go back to sea, or else continue some course, in navy yard work or otherwise, as prescribed by the curriculum. This plan will make surer selections for the two corps concerned, and will also add to the number of specially trained officers in the line.

One of the advantages of having the student officers begin their courses at Annapolis is that, in the first-term theoretical work, the director in each branch of study will be the same one who directs that branch with the midshipmen also, so that he should know best how and where the postgraduate student should go on with that

study. This first term will be alike for all, in the close application required and strict adherence to a fixed schedule, and many of the studies, but not necessarily all, will be common to all students. The second term, the class will begin to separate into their respective specialties. Four months they all must stay; eight months some may stay; but only in exceptional cases will any student officer spend more than eight months at Annapolis, else he would lose that outside experience from which the greatest benefit will be derived.

By the end of the second term (eight months), the student officers will have acquired all the higher theoretical studies that may have been eliminated from the midshipmen's course, and much more besides. Were they immediately to go back to sea again, without any further course, the service would still be the gainer by their special instruction; and the fact that they take this instruction after some sea service, which helps them to appreciate its value and picture its application (which as midshipmen they cannot do), makes the gain all the greater.

Generally speaking, then, the first two terms are preparatory, theoretical, and naval professional. The remaining sixteen months give the broadening touch with people and work outside. The field for choice is unlimited; but we shall progress faster by proceeding moderately. In the present stage, it would be wise to follow along the lines of standard courses outside, until this new organization and system is well settled and running smoothly. By that time we shall be better able to arrange with outside institutions for courses on special lines best suited to our needs; but always we must keep to the principle that outside contact is the first thing to secure.

The mere association of student officers and the members of the Council with civilian experts and authorities in scientific, professional, and technical fields, would alone greatly benefit the service. Those men devote a lifetime to a subject which to us is only one of several duties. They mingle in the technical, scientific, and educational affairs of the whole world, while we follow a profession that exacts almost our entire attention.

In former generations, when our officers could and did take part in outside businesses and rub shoulders in active competition, there were many accomplished men among them, the equals of any in any walk of life; but the present generation suffers from

the evils of professional inbreeding. We can fully remedy this only by outside contact—continuous, intimate contact—getting interested in the great problems of the technical and business world, and in touch with the leading educators, and—what is of equal importance—getting them interested in us. To all this we may confidently expect these postgraduate courses will lead. Associations will be formed that will be of lasting interest and benefit. And not only shall we learn from those in civil life, but those in civil life also will learn something worth having from us. It is an opportunity to spread a better understanding of the navy through the country, since the student officers will often come in contact with civilian students and many others, as well as professors and experts.

Individually, the student officer may improve himself. His specialty should always come first in his thoughts, of course; but, if he choose, he may widen his acquaintance and improve in resourcefulness and in readiness and habit of speech—in short, may cultivate himself as a man of a wider world than before. In the old navy days, foreign cruising, more varied shore employments, and less strenuous service requirements gave more opportunity than we have now for broadening and refining influences; but this Postgraduate Department will open many doors leading to such advantages, if the students will but enter them. Along with all this goes the responsibility which the student officers must feel, that they will be accepted as representatives of the service, and that many will judge the whole corps of officers by their behavior.

To the service at large, the possibilities of benefit are too many to do more than touch upon. Better officers, better specialists; and in turn, after some years, better educators of our own. Steady and constant progress is assured, keeping pace with advance outside. The attitude of our civilian friends could not be more encouraging. The best will always be at our disposal. It rests with us to avail ourselves of it, for the advancement of the navy's usefulness to the country.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE SEAL, OR COAT OF ARMS, OF THE UNITED STATES NAVAL ACADEMY.

By Louis N. Feipel, U. S. Naval Academy Library.

The strictures made upon the present authorized seal, or coat of arms, of the Naval Academy a few years ago[1] by Lieutenant Ridgely Hunt (Ret'd), to the effect that it represents the unfortunate effort of one man, a graduate in civil life, who, singlehanded, in 1898, conceived the design, and, aided by a classmate, succeeded in having it adopted by the Navy Department, have prompted some further investigations into the history of this subject. The story of the adoption of the present device is familiar to all readers of Park Benjamin's "United States Naval Academy," but a restatement of the facts will serve to freshen our memories on some points.

The seal, or coat of arms, of the Naval Academy has for its crest a hand grasping a trident, below which is a shield bearing an ancient galley coming into action, bows on, and below that an open book, indicative of education, and finally bears the motto, *"Ex scientia tridens"* (from knowledge, sea power). The whole is the design of the author and was adopted by the Navy Department in 1898. Up to that year, the Naval Academy had possessed no authorized device, although it had printed on its Registers an arbitrary symbol. The occasion which led to the adoption of the present design was the building of a new club-house by the University Club of New York, on the exterior of which the coats of arms of the several colleges were placed as an embellishment, and this brought the fact to general notice that the Naval Academy had no badge of the kind. The matter was at once taken up by Mr. Jacob W. Miller, of the class of 1867, and mainly through his endeavors the desired approval of the Navy Department was secured.[2]

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[1] Proceedings, Vol. 34, No. 3, Sept. 1908, pp. 813-6.

[2] Benjamin, *United States Naval Academy*, p. 349.

Lieutenant Hunt objects to the galley and the book emblazoned on the escutcheon of his Alma Mater. He quotes the suggestion of a certain iconoclast that the galley was selected because it was a vessel manned by slaves chained to oars, and recalls the remark of some cynic that "2.5" should be imposed on one page of the open book and a mathematical symbol on the other. Above all does he find fault with the motto, "*Ex scientia tridens,*" not only because it is so difficult to translate, but chiefly because the concept embodied therein can hardly give birth to that greater idea—conducive to the proper *esprit de corps*—of allegiance to country. By way of substitute, our critic has recommended the words, "Our country, right or wrong," as being more on a par with that of the Military Academy, "Duty, honor, country."

Mr. Benjamin's statement of facts was published in 1900. Prior to that, however, in the pages of the *Army and Navy Journal* of February 4, 1899, a somewhat more extended, and also more contemporary, account of the origin of the new seal is given. From this account we learn that "the designer's idea in producing the Naval Academy seal was to bring it into harmony with the general character of the emblems of other institutions of learning, thus giving it a classic form, while still emphasizing both its naval and academic features. For this reason it [was] thought better to avoid the ordinary naval designs, such as eagles, anchors, flags, guns, rope, etc., commonly employed on buttons and other official badges. The trident, the ancient symbol of . . . sea power, is made prominent in the crest. The motto . . . is indicative of the purpose of the Naval Academy, which exists in order to educate the men by whom that power is directly wielded. The shield exhibits a Roman war galley coming bows on into action. The scholastic idea is indicated by the open book."

Ignoring the relative weights which ought to be attached to either side of the argument about the appropriateness of the galley, the book, and the motto, we are still to infer from the foregoing accounts that there is one, and only one, authoritative Naval Academy device extant. And such, indeed, was the present writer's belief until he happened to compare the device which is to be found on the official letterheads of the Academy with that which appears on the titlepage of the equally official Annual Register. Figs. 1 and 2 will serve to point out the difference. The explana-

tion of this difference, however, is not apparent on the face of things. Why should the device in one case be enclosed in a solid square, and in the other be a piece of openwork? Why should not the motto be displayed alike in both? And why should the torches in one be different from those in the other?

FIG. 1.—Seal used at present on official letterheads of the Naval Academy.

A clue to a plausible explanation is contained in the article in the *Army and Navy Journal* before mentioned. From this we quote again as follows: "The seals on the [University Club] building are disposed in squares of equal area; and in order to

FIG. 2.—Seal used at present on the Annual Register of the Naval Academy.

fill out the spaces, and also to ensure a general correspondence in appearance, the architect has provided either scroll work or, in many instances, the conventional torches indicated. As the latter are supplied as supporters to a number of the college seals, they form no necessary part of the design specifically

pertaining either to the Naval Academy or the Military Academy, so that the essential features above noted may be used without them or in connection with any other appropriate surroundings which occasion may render desirable." In fine, it would seem that the only definitely fixed portion of the Naval Academy device consists of the hand grasping the trident, the shield with the galley and the open book, and the words of the motto. And it is worthy of note that the device of the Military Academy, as it is found on the official printed matter of the school, omits the supporting torches. However, if due weight is to be given to the letter of the Judge Advocate General of the Navy legally and officially adopting the device of Mr. Benjamin, the choice between the two designs would necessarily lie with that in the square field, as that was evidently the one referred to by the Judge Advocate General as having been passed upon, in blueprint form, by him. The letter of adoption follows:

NAVY DEPARTMENT,
Office of the Judge Advocate General,
Washington, Jan. 25, 1899.

SIR: I have t. inform you that the Department has this day adopted as the seal for the Naval Academy the design indicated by the enclosed tracing and blueprint. I will thank you to furnish for its files copies of the Club circular, dated Dec. 23 last, describing this design. The Superintendent of the Naval Academy has been fully informed in the premises.

By direction of the Secretary,

Very respectfully,
S. C. LEMLY, Judge Advocate General.

What is apparently a facsimile of the original tracing submitted to the Navy Department is given by way of illustration to the article in the *Army and Navy Journal* above cited, and is practically identical with that which graces the official stationery of the Naval Academy.

With regard to the coat of arms of the Military Academy, the story of its designing and adoption reflects greater credit upon the sister institution. This can be gathered from the following extracts taken from a letter addressed to the Editor of the *Army and Navy Journal* by Professor Charles W. Larned:[3]

On May 12, 1896, a committee of the Academic Board of the Military Academy was appointed by the Superintendent to consider and report upon a design for the arms and device of the Academy, and incidentally

[3] *Army and Navy Journal*, Feb. 4, 1899, p. 527.

to devise an appropriate motto to accompany these. After careful deliberation and consultation with leading architects and artists of New York City, and with Dr. E. S. Holden, Herald-at-Arms and author of a recent work on heraldry, the design of Prof. Larned, of the Military Academy, for the device and arms was adopted by the committee, and the motto, "Duty, honor, country," chosen. Its recommendation was unanimously adopted by the Board and officially approved by the Secretary of War. . . . The device of the Academy, which consists of the helmet of Pallas across a sheathed sword, has figured, in its elements, among the insignia of the Academy almost from the foundation of the institution. . . . The official seal of the Academy, approved by the Secretary of War, consists of the device borne upon an oval shield, around which appears the motto, and upon the body of which appears, "West Point, MDCCCII." . . . The whole has been copyrighted.

To render the story of the present Naval Academy seal as nearly complete as possible, and before proceeding to the second part of this investigation, the following anecdotes ought to be recorded:

Secretary Long is reported to have asked whence the motto, "*Ex scientia tridens,*" came. The anonymous writer in the *Army and Navy Journal*[4] assured the Secretary that the designer was wholly responsible for it, adding that Mr. Benjamin insisted that the making of Latin epigrams in emergencies was merely one of the numerous things to be expected as a matter of course of Naval Academy graduates. Some one else, of an equally inquiring turn of mind, asked what book was meant by the open volume on the shield. Our worthy contributor remarks that "like Sam Weller's spelling, this depends upon the 'taste and fancy' of the observer, but if any particular book is to be associated hereafter with the representation, it seems to us that it might well be Luce's 'Seamanship,' not so much in memory of the work, which will last as long as naval officers are sailors, as of its author, to whom the Naval Academy is so greatly indebted, and whom so many of its graduates remember with reverence and affection."

Enough has now been said to indicate that our emblem, of which we should be justly proud, has been repeatedly held up to ridicule. It remains but to show that the previous history of the Naval Academy seal has been permitted to fade into almost utter oblivion. If a few relics thereof can possibly be resurrected at this late hour, a record of them should surely be preserved.

The promoters of the present authorized seal declared that there was no regularly adopted device extant at the time they instituted

[4] *Ibid.*

their inquiries. The only thing in the nature of a seal which they were able to discover was the design, consisting of a field of diagonal stripes, surrounded by stars, and bearing a foul anchor (Fig. 3), which had embellished the titlepages of the official registers of the Academy for nearly thirty years, namely from

FIG. 3.—Seal of the Naval Academy in use from 1874 to 1900.

1874 to 1900. That this design had never been regularly adopted as the official device of the Academy may be true. But surely thirty years of undisputed sway ought to carry with it considerable weight of prescriptive authority. Be that as it may, the fact

FIG. 4.—Device used at present by the Naval Academy Library.

remains that the design was officially discarded and its place taken by the new one. Notwithstanding this fact, however, it is curious to note that the devices of the Naval Academy Library, the Naval Academy Graduates' Association, and the Naval Institute—all three of them deriving their origin from the parent institution—

have adhered to the old design instead of changing over to the new. (Figs. 4, 5, and 6.)

But what is to be held regarding the other thirty years previous to the first appearance of this star-stripe-anchor device? Was there no seal or device used by the Naval Academy in all those

FIG. 5.—Device used at present by the U. S. Naval Academy Graduates' Association.

years? To judge from the non-appearance of such a device on the Registers and other official publications of the Academy prior to 1874, one might be justified in answering that there was indeed none. Fortunately, however, there exist among the store of books in the Naval Academy Library a few examples of an

FIG. 6.—Seal of the U. S. Naval Institute.

apparently forgotten device which must once have been the acknowledged—although possibly unofficial—seal of the Academy. The writer has come across only three specimens, of which only one is perfectly clear in its outlines. All of them furthermore appear stamped on book covers, and not one of them on any page

of a book; so that there is great danger of these specimens being some day lost when the books in question go to be rebound. The two books which have thus become of added value to the archives of the Naval Academy are Marshall's "History of the United States Naval Academy," published in 1862, and the fifth edition of

FIG. 7.—Device stamped on cover of Marshall's "History of the U. S. Naval Academy" (1862).

Simpson's "Treatise on Ordnance and Gunnery," published in 1871. In the first case the design is stamped in gold on the front cover, thus standing out distinctly; but in the other case, although the design appears on both the front and the back cover, the im-

FIG. 8.—Device stamped on cover of Cooke's "Textbook of Naval Ordnance and Gunnery" (2d edition, 1880).

pression was plainly made with a bare die, and the various parts of the design are hard to make out. By referring to the reproduction of this seal (Fig. 7) it will be seen that it contains most of the old conventional naval insignia which the designer of the present coat of arms so ruthlessly rejected in 1898. The list com-

prises a figure of Liberty (seated), an eagle, a shield, stars and stripes, an anchor, a ship, a globe, a compass, a pair of dividers, a sextant, cannon, and cannonballs. The only element lacking, to make it into a suitable device for the institution which it represented, is a motto.[8]

There may have been other seals of the Naval Academy in use in former times, examples of which may yet be discovered. The only remaining device of the sort of which the present writer has any knowledge is a design (Fig. 8) which is to be found stamped on the cover of Cooke's "Textbook of Naval Ordnance and Gunnery," second edition, 1880, consisting of a circle of rope, inclosing a monogram of the initials U. S. N. A., the whole mounted upon the intersection of two cannon crossed. However, this is to be regarded rather as a device gotten up for the occasion, than as a regular seal of the Academy.

When all is said, the only really good point in favor of the present device is that it is what it purports to be, namely, a coat of arms, whereas all that have gone before cannot possibly lay claim to that appellation in the strictest sense of the term.

[8] The design may possibly have been modeled upon that which figures as the frontispiece to Brady's "Kedge Anchor."

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A HALF CENTURY OF NAVAL ADMINISTRATION IN AMERICA, 1861-1911.

By CHARLES OSCAR PAULLIN.

II.

THE NAVY DURING THE CIVIL WAR, 1861-1865.

President Lincoln has briefly described the work of the navy during the Civil War in most characteristic words, written on August 26, 1863, in response to an invitation to attend a mass-meeting of "unconditional Union men" to be held at Springfield, Illinois, the President's home town. Having referred to the achievements of the army at Antietam, Murfreesboro and Gettysburg, he paid his respects to its sister-service: "Nor must Uncle Sam's web-feet be forgotten. At all the watery margins they have been present. Not only on the deep sea, the broad bay, and the rapid river, but also up the narrow, muddy bayou, and wherever the ground was a little damp, they have been and made their tracks. Thanks to all." [32]

The principal work of the navy during the war was the blockading of the coast of the Southern states and the patrolling of their sounds, bayous and larger rivers. The length of the coast blockaded, measured from Alexandria, Virginia, to the Rio Grande, was 3549 miles. A large part of the coast presented a double shore. There were 189 harbors, openings to rivers, or indentations to be guarded. On the Mississippi River and its tributaries the gunboats traversed and patrolled 3615 miles; and on the sounds, bayous, rivers and inlets of the Atlantic and Gulf coasts, about 2000 miles. For the purposes of blockade and patrol the waters surrounding the Confederate states were divided into six divisions, and a squadron under the command of a flag-officer

[32] Nicolay and Hay, Complete Works of Lincoln, IX, 101.

or rear-admiral was assigned to each. The Potomac flotilla patrolled the waters of the Potomac and Rappahannock rivers. After 1862 it was chiefly employed in suppressing illicit commerce and unauthorized communications with the Confederates. In September, 1862, the original Atlantic and Gulf blockading squadrons were each divided. Two squadrons, the North Atlantic and South Atlantic, blockaded the Atlantic coast. The line of division between them was the boundary between North and South Carolina. The territory of the East Gulf squadron extended from Cape Canaveral to Pensacola; and that of the West Gulf squadron, from Pensacola to the Rio Grande. In 1864 the limits of the East Gulf squadron were extended so as to include the waters of Cuba and the Bahamas. The Mississippi flotilla held open for the Unionists the Mississippi River and its chief tributaries, and prevented the Confederates west of the river from trading or communicating with those east of it. In 1864 the waters traversed by the Mississippi flotilla were divided into ten naval districts, and a naval officer was placed in command of each of them. At the beginning of the war the blockading of the extensive coast of the Confederacy was deemed impossible by many, both at home and abroad. By the fall of 1861, however, it was an accomplished fact and it remained so throughout the war. Still, at no time was it wholly impossible for a Confederate privateer or a neutral adventurer to enter the Southern ports or escape therefrom.[33]

Next in importance to blockade duties, were the operations of the navy, alone or in co-operation with the army, against the batteries, forts and fortified towns on the seacoast and rivers of the Confederacy. The first important operations of this sort were the capture of Hatteras Inlet, North Carolina, by Commodore Silas H. Stringham and General B. F. Butler in August, 1861; the reduction of Forts Walker and Beauregard and the occupation of Port Royal, South Carolina, by Commodore S. F. Dupont and General Thomas W. Sherman in November, 1861; and the taking of Forts Henry and Donelson, in Kentucky, by Commodore A. H. Foote and General U. S. Grant in February, 1862. To the same class belong Farragut's memorable achievements at New Orleans, Vicksburg and Mobile; Porter's at Fort Fisher, Dupont and Dahlgren's at Charleston, and the perilous

[33] Ann. Rept. of Sec. of N., 1863, iii-iv; 1864, ix, xv.

and daring campaigns of Flusser and other gallant officers on the sounds and rivers of North Carolina. In reducing the fortified places on the Mississippi River and its tributaries, the services of the Mississippi flotilla were exceedingly valuable. Porter said that no vessels of the navy engaged in so many successful battles or made such a record for their commanding officers as did those on the Mississippi. During the first months of the war, the Potomac flotilla found employment in silencing the Confederate batteries which were planted on the banks of the Potomac River.

Many ships were sent in pursuit of the Confederate commerce-destroyers. On one occasion about thirty vessels were searching for a single ship of the Confederates, the *Tacony*, which is said to have been the only " rover " that attacked our navy at the entrance of our harbors. In the summer of 1862 a flying squadron, under the command of Acting Rear-Admiral Charles Wilkes, was established in the West Indies to capture the enemy's rovers and blockade-runners. The Confederate rovers or commerce-destroyers inflicted an enormous damage on American commerce and nearly drove it from the seas. The most destructive ships were the English-built vessels *Alabama, Florida, Georgia* and *Shenandoah*. The permitting of these vessels to sail by the British government was regarded by the United States as a breach of the laws of neutrality. The *Alabama*, Captain Raphael Semmes, destroyed some 60 vessels and $10,000,000 worth of property. She was finally sunk by the U. S. S. *Kearsarge*, Captain John A. Winslow, off Cherbourg, in June, 1864. The *Florida*, after having captured 21 vessels, was seized in the harbor of Bahia, in October, 1864.

During the war the expenditures of the navy were vastly increased, and were at the time wholly unprecedented. The net expenditures rose from $12,000,000 for the fiscal year 1861 to $123,000,000 for 1865. The largest annual appropriations for the navy were for the fiscal year 1863, and amounted to $144,000,000. The total expenditures for the navy during the war were $314,000,000; the average annual expenditures were $73,000,000. The expenditures for the navy, however, were only 9.3 per cent of the total expenditures of the federal government. The total value of the vessels captured and destroyed by the navy was about $31,500,000. Many of these belonged to neutrals and were captured while trying to run the blockade. The value of the captured vessels alone was placed at $24,500,000. The number of vessels captured

and sent to the courts for adjudication was 1149; the number destroyed, 355; total, 1504. In 1868 the Navy Pension Fund, which is derived from one-half the proceeds arising from the sale of prizes, amounted to $14,000,000.[24]

The purchase and construction of vessels constituted a large source of expenditure. On March 4, 1861, the number of vessels in the navy, including receiving ships, vessels in ordinary, and ships both in and out of commission, was only 90. In December, 1864, when the navy was at or near its maximum strength, it contained 671 vessels. Their total tonnage was 510,396 tons, and they were armed with 4610 guns. From 1861 to 1866, 179 vessels were built and launched, and 497 were bought or transferred from some other executive department to the navy. These figures do not include the "stone fleet" of 78 vessels, which were purchased and sunk as obstacles to navigation. Still other ships were placed on the stocks, but they were not completed. The department purchased 313 steamers, at a cost of $18,000,000. The 179 ships that were constructed and completed during the war were all steam vessels. Fifty-five of them were built by the department at the Northern navy-yards, and 124 were constructed under contract. The cost of most of the vessels built during the war ranged from $75,000 to $650,000. The highest-priced vessel, the *Madawaska*, however, cost $1,673,000. The cost of the purchased vessels ranged, as a rule, from $10,000 to $60,000. The largest price, $595,000, was paid for the prize-ship *Tennessee*. The 671 vessels that comprised the fleet in December, 1864, were of the following classes: Screw steamers especially constructed for naval purposes, 113; paddle-wheel steamers especially constructed for naval purposes, 52; ironclad vessels, 71; steamers, chiefly purchased or captured, and fitted for naval purposes, 323; sailing vessels of all kinds, 112. Of the 671 vessels, 559 were steam vessels.[25]

The department purchased every available merchant steamer in the Northern ports that could be advantageously converted into a naval vessel and used on the blockade. Great pressure was brought to bear on the department to buy ships that were unfit for blockade duty. The purchased vessels are said to have repre-

[24] Sen. Ex. Doc., 45 Cong. 1 sess., No. 3, 156-157; Ann. Rept. of Sec. of N., 1865, xxx, xxxii; 1868, xxviii.

[25] Sen. Rept. 37 Cong. 2 sess., No. 37, 96-102; House Ex. Doc., 40 Cong. 2 sess., No. 280; Ann. Rept. of Sec. of N., 1864, xxii-xxiv; 1865, xii-xiii.

sented every style of marine architecture "from Captain Noah to Captain Cook." The best market for vessels was at New York, and many ships were obtained at that city. In the summer of 1861 Secretary Welles appointed a board, composed of a naval constructor, engineer and ordnance officer, to reside at New York, to visit all ships offered to the department and to determine their fitness and adaptability for naval purposes. The Secretary appointed Mr. George D. Morgan to act as the purchasing agent of the department. Morgan purchased the ships, guarded the interests of the public by investigating and certifying titles, and in general managed the mercantile and legal side of the transactions. He was a brother-in-law of Mrs. Gideon Welles, and was regarded by the Secretary as a man of great integrity, commercial experience and capacity for business.

A steam tug was placed at the disposal of Morgan and the board of inspection, and they proceeded daily for many weeks to inspect the vessels offered to the department in and near New York. By December 4, 1861, Morgan had purchased 90 vessels, at a cost of $3,500,000—a reduction of 25 per cent on the prices first asked by the owners. His commission was 2½ per cent of the cost-price, and was paid by the seller. This was the rate and method of levying established by the New York Chamber of Commerce. His income for five months' work amounted to $70,000. Welles was severely criticised for nepotism in employing his brother-in-law; for paying him so large a commission; and for levying it on the seller, who, of course, raised his selling-price accordingly. In January, 1862, the Senate Naval Committee made a report adverse to Morgan's agency, declaring that the practice of levying commissions upon the selling-price of ships was reprehensible. It should be said, however, that the New York Chamber of Commerce had established this custom and had fixed the agent's commission at 2½ per cent. That Morgan performed his work skilfully and honestly was not questioned. John Murray Forbes, who regarded Welles as an "honest old Democratic editor who knew but little of business," said in February, 1862, that Morgan's work was, "without being perfect, the best done of any that the government had yet done, always excepting Stanton's slaying of the Satanic."[36]

[36] Ann. Rept. of Sec. of N., 1861, 14-16; Sen. Rept., 37 Cong. 2 sess. No. 9; Sen. Doc., 37 Cong. 2 sess., No. 15; Hughes, Forbes, I, 230-231, 289-290; Congress Letters, XIII, 405; Diary of Gideon Welles, I, 487.

The method of purchasing vessels followed at some of the other Northern seaports was similar to that at New York. At Boston, during July and August, 1861, a commission composed of Commodore W. L. Hudson, the commandant of the Boston navy-yard; Mr. J. C. Delano, of New Bedford; and Mr. John Murray Forbes, of Boston, purchased merchant ships for the navy, fitted them for sea and selected some of their officers. Forbes, who was a most highly esteemed and successful merchant of Boston, showed great public spirit during the war, and rendered the Navy and War Departments invaluable aid. In April and May, 1861, he procured and fitted out the transports that carried the troops of his state to the relief of Washington, and he merited the title, which he won, of "Secretary of the Navy of Massachusetts." The members of the Boston commission, in sharp contrast to Morgan, made no charges for their services, and Forbes was inclined to believe that they even paid their traveling expenses. After the commission was dissolved, Forbes continued, when called upon, to serve the Navy Department. In January, 1862, he was directed by Secretary Welles to charter a vessel for three months or a longer period to go in pursuit of the Confederate commerce-destroyer *Sumter*, and to suggest proper men for commander and masters of the chartered vessel.[37]

The first vessels of the Mississippi flotilla were three Ohio River steamers, which were purchased at Cincinnati in May and June, 1861, by Commander John Rodgers, and were converted into gunboats. During 1861 and a part of 1862 the Mississippi flotilla was under the control of the War Department, although its vessels were commanded by naval officers. In September, 1861, Commodore A. H. Foote assumed command of the flotilla. In August Quartermaster-General Meigs of the War Department contracted with James B. Eades, the celebrated civil engineer, to build seven ironclad gunboats. Such were the energy and celerity with which Eades performed his work that two weeks after entering upon his contract he had 4000 men in his employ, and within 100 days he had completed his vessels, their aggregate tonnage being 5000 tons. On October 12, 1861, the first of these gunboats was launched, with her boilers and engines on board. She was named the *St. Louis* by Commodore Foote, and was the first completed ironclad in the United States. Before the war ended, more than

[37] Hughes, Forbes, I, 228-233, 292-293.

100 vessels were stationed on the Mississippi River and its tributaries."

Many of the ships purchased for the navy were not adapted for naval purposes, and therefore wore out rapidly and soon needed extensive repairs. Some of the old ships of war could not be used in shallow waters. On the blockade, the navy needed many light-draft, heavily armed vessels; and before Congress met in July, 1861, the Navy Department had contracted for the construction of 23 gunboats, of the *Unadilla* type. Four months after the date of their contracts, several of these vessels were afloat, and were armed, manned and commissioned in time to participate in the first important naval operation of the war, the capture of Port Royal, in November, 1861. Next, the department built several larger ships, adapted to deep-sea navigation, such as the *Ossipee, Kearsarge,* and *Shenandoah.* As the war progressed, the naval service required vessels of various other types, the designing of which fell, in large part, to the Bureaus of Construction and Repair and Steam Engineering. The turreted monitors, after they had been tested in the memorable engagement between the *Monitor* and the *Merrimac* in March, 1862, were especially favored by the department, the press and public opinion. Various other kinds of ironclads were constructed. A "double-ender," with a bow and rudder at each end, was devised in order to obviate the necessity of turning the vessels in the narrow channels of the Southern rivers and inlets. Thirty-seven of these were built, some of iron and others of wood. Each year of the war saw produced in foreign shipyards blockade-runners of greater and greater speed. For the purpose of capturing these ships, and English commerce-destroyers in case of a war with the mother-country, the construction of seven fast cruisers of increased steam-power and of decreased armament was commenced in 1863. Two vessels of this type, fitted out with Isherwood's machinery, were completed after the close of the war, the *Wampanoag* and *Ammonoosuc.*

In the construction of vessels, both private and public enterprise were drawn upon by the department. All the public navy-yards and many private shipyards were pressed to their utmost capacity. There were but few eminent ship-builders or manufacturers of

[11] Hoppin, Admiral Foote, 164-165; Bennett, Steam Navy, 282-285; Boynton, Navy during the Great Rebellion, I, 502-504.

steam engines that were not in the employ of the government. Not a little rivalry and jealousy arose between public and private builders of ships and engines. The work of the Secretary of the Navy was severely criticised, and malignantly misrepresented. The department was accused of procrastination and needless delays. It was asserted that the hulls of its new vessels were defective, their engines worthless, and their speed far below the requirements of the navy. Isherwood's steam machinery was the subject of incessant attack. He was represented as a mechanical theorist and visionary, who loaded the naval ships with excessive and defective machinery. The critics of the department generally knew little of the magnitude, complexity and difficulties of its work, and were rarely impartial and discriminating in their criticisms. Several vessels were built by private enterprise with the avowed purpose of proving the faults alleged to exist in the practice of the department, but competitive tests between the vessels of private and of public construction showed the superiority of the latter. Mr. E. N. Dickerson, an engineer, and Mr. Paul S. Forbes, a responsible capitalist of New York City, were especially outspoken in their criticisms of the department. They were finally given an opportunity to prove their assertions by being permitted to build the machinery of the steamers *Algonquin* and *Idaho* after their own plans. On trial the vessels failed completely to substantiate the claims of Forbes and his engineer. The *Idaho* fell short of her required speed almost one-half. When Forbes refused to fulfill his contracts, the Secretary of the Navy declined to accept the vessels or to pay for them. Thereupon Forbes appealed to Congress, and that body forced the vessels upon the department.[39]

Another controversy, which caused much ill-feeling, arose over the introduction into the navy of mastless war vessels. The traditions and conservative instincts of the old navy were opposed to these ships. Not a few officers regarded them as "engineers' vessels" and as overloaded with machinery. The most important ships of this type developed by the Civil War were the monitors, or turreted ironclads, whose operations demonstrated the utility and practicability of armored vessels and of the turret system of mounting guns, and revolutionized modern naval warfare. In 1861 wooden screw-propelling steamships were the latest and most improved type of vessels in the American navy. In the European

[39] Congress Letters, XIV, 259-260; Bennett, Steam Navy, 514-531.

navies a few ironclads had been built and were building, but this type of vessel had hardly passed the experimental stage.

In introducing armored ships, the Confederates showed much enterprise. In May, 1861, S. R. Mallory, the Confederate Secretary of the Navy, wrote that "not only economy, but naval success, dictates the wisdom and expediency of fighting with iron against wood, without regard to first cost."[40] Early in 1862 Mallory had several ironclads nearing completion. The *Merrimac* was converted into an ironclad battery, and on March 8 made her famous raid upon the Unionist shipping at Hampton Roads, Virginia, capturing the *Congress* and sinking the *Cumberland*.

The Federal government proceeded with deliberation and caution. As early as March, 1861, the attention of the department was directed by a correspondent to the subject of ironclads. On July 4, 1861, Secretary Welles recommended the appointment of a board to report respecting "ironclad steamers or floating batteries." On August 4 Congress authorized the Secretary of the Navy to appoint a board consisting of three skilful naval officers "to investigate the plans and specifications that may be submitted for the construction or completing of iron- or steel-clad steamships or steam-batteries." Should the board report favorably, the Secretary of the Navy was authorized to cause one or more such vessels to be built. For their construction Congress appropriated $1,500,000.[41]

Welles at once appointed the Ironclad Board, choosing as members of it Commodores Joseph Smith and Hiram Paulding and Commander C. H. Davis. On September 16 the board made a conservative report, which, however, was favorable to the construction of ironclads. Its members confessed to having had no experience in this branch of naval architecture and but little knowledge of the subject. For the defense of coasts and harbors it conceived that ironclads would be formidable adjuncts to the fortifications on land, but it doubted whether these ships would prove to be valuable cruising vessels. Of the seventeen plans that were submitted to it, the board recommended that three be accepted, those of Bushnell and Company of New Haven, Merrick and Sons of Philadelphia, and John Ericsson of New York. The contracts were let and work upon the three vessels was com-

[40] Wilson, Ironclads in Action, I, 3.

[41] General Letters, LXIV, 43; U. S. Statutes at Large, XII, 286; House Ex. Doc., 38 Cong. 1 sess., No. 69.

menced in the fall of 1861. Each ironclad was of a different type, and all were completed in 1862. The *Galena,* owing to deficient armor, was a failure. The *New Ironsides* rendered good service until the end of the war. The third vessel was the *Monitor,* built after the plans of Ericsson.

Externally, the *Monitor* looked like a long oval raft with a single tower in the center, a "cheese-box on a raft." She had an extraordinary low free-board. Her extreme length was 172 feet; extreme breadth, 41 feet, 6 inches; depth of hold, 11 feet, 4 inches; mean draft, 10 feet, 6 inches; and height of turret, 9 feet. She had five layers of one-inch iron on her hull, and eight layers on her single steam-rotating turret, where were installed two 11-inch Dahlgren guns. She was built under the direction of Joseph Smith, chief of the Bureau of Yards and Docks, and president of the Ironclad Board. John Lenthall, chief of the Bureau of Construction and Repair, had no faith in Ericsson's plans, declaring that the *Monitor* would sink when she was launched. Many other naval officers had strong doubts of her seaworthiness. While she was building, the department was much ridiculed and abused for its novel experiment in naval architecture. She was sometimes referred to as "Ericsson's Folly." Welles, who was early convinced of her merits, was unmoved by the clamor. Credit for her construction is said to belong largely to the Secretary of the Navy, for appreciating her possibilities and for his action in influencing the board to approve the original plans; to her distinguished inventor, John Ericsson; to Chief Engineer A. C. Stimers, who superintended her construction; and to the Ironclad Board and especially its president, Rear-Admiral Joseph Smith. The opportune appearance of the *Monitor* at Hampton Roads and her dramatic fight with the *Merrimac* on March 9, 1862, are familiar to all students of history. The epoch-making character of this engagement in the annals of naval warfare, and the timeliness of her victory to the North, make the *Monitor* one of the most famous ships of the American navy.[42]

The success of Ericsson's vessel gave a great impetus to the

[42] Ann. Rept. of Sec. of N., 1861, 152-156; Bennett, Monitor and Navy under Steam, 70-93; Sen. Rept., 38 Cong. 2 sess., No. 142, pt. 3, p. 93; Porter, Naval History of the Civil War, 360-361; Bennett, Steam Navy, 281; Manuscript Papers of Gideon Welles; Diary of Gideon Welles, I, 214-215.

building of ironclads, and especially those of the monitor type. The newspapers which before the fight at Hampton Roads bitterly declaimed against the new ship now became its warmest partisans. A "monitor heresy" (in the view of some of the naval experts) swept over the country. A "monitor-ring" encouraged the craze. Both Welles and Fox were champions of the new type of ship. On March 31, 1862, Welles contracted with its distinguished inventor for six new monitors, to be built on a somewhat improved plan. On March 25 he recommended that $30,000,000 be appropriated for ironclads, ordnance and armor-plate. Already on February 13, Congress, in response to a recommendation in Welles's annual report for 1861, had appropriated $10,000,000 for ironclad steam gunboats. The opinion of many naval officers was by no means favorable to the monitors, although they were rated highly by Porter, Dahlgren and John Rodgers. The awkward appearance of these vessels, their restricted and uncomfortable quarters and the difficulties of navigating them contrasted unfavorably with the trim, capacious and manageable ships of the old types. They were regarded by some of the principal naval officers as deficient in offensive powers. A considerable difference of opinion respecting their merits arose between the Navy Department and Rear-Admiral S. F. Dupont, who in the first years of the war was in command of the South Atlantic blockading squadron. Welles and Fox were inclined to attribute Dupont's failure in his attack on Charleston in April, 1863, to his depreciation of the qualities of the monitors of his fleet, but the verdict of history seems to be that Dupont judged the worth of his vessels more accurately than did the department. The monitors were a transitional type of steamship.

The light-draft monitors are of unsavory memory, for their construction was the principal blunder of the Navy Department during the Civil War. They were to draw but six feet of water and were designed by Ericsson to meet the needs of the navy for armored vessels capable of navigating shallow rivers and other inland waters. The construction of twenty of them was undertaken in 1863. The contracts were distributed among a dozen cities, from Portland, Maine, to St. Louis, Missouri. The department cut the red-tape by placing their construction in the hands of Chief Engineer A. C. Stimers, who was acting chief of the New York Bureau, and who in building the *Monitor* had convinced the

department of his professional skill. While he was expected to advise with Ericsson, he was permitted to construct the vessels according to his own ideas, and to perform his work more or less independently of both Ericsson and the department. The ships began to arrive at completion in 1864 and at once revealed structural defects so serious as to destroy their usefulness. They were especially defective in draft and speed. They would barely float, and could not be risked in high seas. Their speed, which was to have been seven to nine knots an hour, was only three to four knots. Stimers was not alone implicated in their failure, although he was chiefly responsible for it. The department was to blame for exercising too little supervision and for intrusting its work to an incapable agent. The loss to the government may be estimated at $10,000,000.[43]

Since the science of naval architecture was in a transitional state, much experimenting necessarily had to be done during the war, and some failures were inevitable. The department tried various classes and sizes of ironclads, constructed of wood or of iron, propelled by one or by two screws. It thoroughly tested nearly every variety and type of engine, valve-gear, screw-propeller and boiler. It sent a chief engineer to Europe to collect information relating to steam engineering. Steam machinery of various sorts was designed by both the Bureau of Steam Engineering and by private manufactories. Nearly all the kinds of coal to be found in the seaboard states were made the subject of careful experiment, with a view to ascertaining their comparative value for naval purposes. A board of engineers experimented with petroleum as a substitute for coal on board naval steamers.

The supplying of the navy with ordnance, projectiles and ammunition was a work of considerable magnitude and was performed by the Bureau of Ordnance with great promptness and efficiency. In March, 1861, the navy possessed 2966 heavy guns and howitzers. By November 1, 1864, 4333 new guns had been added. The new guns were of a much larger caliber than the old, which were chiefly 8-inch and 10-inch guns and 32-pounders. Many of the new guns were manufactured after the Dahlgren, Fox or Parrott models. The Dahlgrens were 9-inch, 10-inch and 11-inch guns. The Fox 15-inch guns were introduced by Assistant Secre-

[43] Ann. Rept. of Sec. of N., 1865, xiii, xviii; Preble, Boston Navy-Yard, 431.

tary Fox, and were considered most ponderous and powerful." The Parrott guns were rifled, and fired balls often weighing 100 or 150 pounds. Unfortunately they proved to be weak in the muzzle, and many of them burst with disastrous effect. Some of the Dahlgrens were also rifled, but most of the guns of the Civil War were smooth-bores. In 1863 some seven or eight firms were making guns for the Navy Department. The chief foundries were situated at Boston, South Boston, Providence, West Point, Reading and Pittsburgh. Naval officers were detailed to these private establishments to inspect materials and test the finished guns. Some notion of the difficulties of the department, as well as of its methods of business, may be gained from the following letter of Assistant Secretary Fox, dated November 22, 1862:

> There are no big guns to spare. Parties cannot make guns who are not experienced. We have started a half dozen new foundries in New England the last year, and got only one good gun. Any man for a year past, and now, who wishes a contract for big guns can have it. No one has ever been refused. As to ironclads, it is the same. Every one is invited and has been, and no one capable of doing the work has been refused. So with marine engines. We will build a vessel for every party who will take an engine. Washington is reported to have said, "In peace prepare for war." We didn't, and here we are. It is no use to sacrifice anybody; we are caught unprepared, and must pay for it . . . We fired the 15-inch gun at nine inches of iron. It did not penetrate, but it shook the whole affair nearly to pieces. We are in the hands of the contractors, who are doing all they can, but it is far short of public expectation.[45]

The gun carriages were manufactured chiefly in the navy-yards. The "ordnance yard" at Washington employed about six hundred men, and performed many important duties. It furnished the standards that governed the manufacture of ordnance at all the yards and foundries. It tested guns at its experimental batteries, and safeguarded the navy against nostrums and would-be inventors and speculators; and it fabricated boat guns, gun carriages, fuses, primers, percussion caps, fireworks and ammunition. The principal ordnance depots were at New York and Boston. Depots were also maintained at the other Northern yards, and at Fortress Monroe, Baltimore and Mound City. Ordnance storeships were stationed at Port Royal, Key West, Pensacola and New Orleans. The Pacific squadron was supplied with ordnance at the Mare Island navy-yard.[46]

[44] Ann. Rept. of Sec. of N., 1863, pp. 840-845; 1864, pp. 970-975.
[45] Hughes, Forbes, I, 341.
[46] Ann. Rept. of Sec. of N., 1864, pp. 984-985.

The projectiles used in the Civil War were classified as smooth and rifled; and as shells, shot, shrapnel, grape and canister. The smooth projectiles were spherical in shape; and the rifled, elongated and of various forms and kinds. The Dahlgren, Parrott, Hotchkiss and Schenkl projectiles were the best-known types. From March, 1861, to October, 1863, 6,926,000 pounds of shrapnel, grape and canister were cast at the navy-yards, and 2,637,000 pounds of the same were purchased. During the same period the Bureau of Ordnance ordered for its use 2980 tons of gunpowder. This article was manufactured in the loyal states in sufficient quantities to meet the needs of the navy. Early in the war foreign nitre was exclusively used. Subsequently, however, nitre as good in strength as the imported article was manufactured by the New Haven Chemical Works. In 1864 a nitre depot was established at Malden, Massachusetts. Gunpowder magazines were situated near the Northern navy-yards, and at Baltimore and Fortress Monroe. The magazine at the latter place had a capacity of three thousand barrels. During the last two years of the war much attention was given to the subject of torpedoes.[47]

The ropewalk at the Boston navy-yard ran night and day and supplied the larger sizes of rope required by the navy. The smaller sizes were purchased from private manufacturers. The Washington navy-yard furnished a large part of the supply of anchors and cables. The equipping of ships with these and similar articles, and also with coal, fell to the Bureau of Equipment and Recruiting. It established a line of colliers, connecting with the blockading squadrons, Southern naval stations and several West Indian ports. Coaling depots were maintained at Havana, Guantanamo, Nicholas Mole, Cape Haytien, San Juan, St. Thomas, Pointe à Pitre and Curaçao. Outside of the West Indies the navy had coaling depots at Honolulu, Rio de Janeiro, St. Vincent, Fernando Po, St. Paul de Loando, Lisbon, Halifax, and St. John's in Newfoundland. Three colliers were captured by the Confederates, and during the last two years of the war 21 colliers were otherwise lost. A large part of the coal used by the navy was purchased by Commodore H. A. Adams, Sr., who was stationed for that purpose at Philadelphia. The naval vessels at no time experienced any serious inconvenience from

[47] Ann. Rept. of Sec. of N., 1863, pp. 847-848, 852.

want of coal. The consumption of this article in 1864 was about 500,000 tons.[48]

The work of purchasing and distributing supplies of food and clothing fell to the Bureau of Provisions and Clothing, whose efficient chief during the war was Paymaster Horatio Bridge. The economical management of this bureau is shown by the fact that the annual "clothing fund," which before the war amounted to about $570,000, was for 1864 less than four times this sum, although the number of men employed in the navy had increased sixfold and the average price of clothing had more than doubled. This bureau experienced many embarrassments in its work, owing to a lack of sufficient storage facilities and wharf accommodations in the several navy-yards. In 1863 Bridge obtained the permission of Congress to inaugurate a new system of supplying the navy with bread. Previously this essential article had been purchased of contractors and bakers and its quality was often poor. The flour was now purchased by the department, and the bread was baked under naval inspection. Under the new plan the bread cost less and its quality was much improved.

The employment in the navy of regular lines of supply steamers, with refrigerators on board, is said to have been an entirely novel undertaking. The initial step in providing these vessels was an order of Secretary Welles to Bridge, dated July 19, 1861, which read as follows:

> You will proceed to New York and take the requisite means for placing on board the Steamer *Rhode Island* fresh beef, vegetables and other supplies necessary for crews of blockading vessels south of Cape Hatteras. Your arrangements will be made with reference to supplying all the vessels with fresh beef and vegetables on the outward trip of the *Rhode Island*, and on returning.

This ship was commanded by Lieutenant S. D. Trenchard. When the system was completed, two fast steamers ran regularly between Northern ports and the West Gulf squadron, and carried at each trip 25,000 to 35,000 pounds of fresh beef preserved in "capacious ice-houses," and 600 to 700 barrels of fresh vegetables. One large steamer, each, supplied the East Gulf and South Atlantic squadrons; and a small steamer, the North Atlantic squadron. These vessels obtained their supplies at New York, Boston and Philadelphia, and ran almost with the regularity of steam

[48] Ann. Rept. of Sec. of N., 1863, pp. 761-762; 1864, p. 909; 1899, p. 304.

packets. They also performed many incidental services, such as conveying mail, dispatches and passengers. They carried sutlers who sold various luxuries to the sailors. The supply steamers added greatly to the comfort and health of the officers and seamen of the blockading squadrons, and did much to brighten their monotonous and perilous life. A similar system was in operation on the Mississippi River.[49]

The facilities of the Bureau of Medicine and Surgery for caring for the sick and wounded of the navy were greatly increased. Early in the war the naval hospitals at Chelsea (Massachusetts) and New York City, the Naval Asylum at Philadelphia, and certain quarters placed at the service of the bureau in the St. Elizabeth Insane Asylum at Washington, afforded ample accommodations. These, however, soon became inadequate and additional quarters had to be rented. The hospitals at Chelsea and New York were enlarged. In 1863 a naval hospital was founded in Washington. It was located on Pennsylvania Avenue, near the navy-yard, on a site long owned by the government. The plain brick building that was erected here was not, however, ready for occupancy until 1866. In 1864 Congress appropriated $75,000 for an addition to the Naval Asylum at Philadelphia; but owing to the high prices asked for materials, the proposed improvement was not made during the war. A sum of money was also appropriated for a hospital at Portsmouth, New Hampshire. Unfortunately, the selection of a location became involved with the purchase of Seavey's Island and with certain political and private interests, and a hospital at this point was not erected. A naval hospital was established at the Mare Island navy-yard.

When the Confederates abandoned the naval hospital at Norfolk in the spring of 1862, they stripped it of its furniture and left it in a filthy condition; but otherwise it was not damaged. It was reoccupied by the Unionists, and by the end of 1862 it contained two hundred and fifty sick and wounded men. The Confederates burned the navy hospital at Pensacola. On the recapture of this place, a temporary building was made ready for naval patients. Temporary hospitals were also provided at Beaufort, Newbern and Port Royal. The marine hospital at Key West, under the control of the Treasury Department, afforded accommodations for the

[49] Ann. Rept. of Sec. of N., 1863, p. 1034; 1864, p. 1162; 1865, pp. 374-376; Bureau Letters, IV, 4; Maclay, Reminiscences of the Old Navy, 104-207.

sick sailors of the East Gulf squadron. At New Orleans a hospital of the War Department was placed at the service of the navy. Early in the war the Mississippi flotilla sent its sick and wounded to Mound City, Illinois, where a temporary hospital was established. In March, 1863, this was abandoned, and the hospital for the flotilla was located at Memphis. Ample accommodations were here found in the "Commercial Hotel." A hospital steamer was employed on the Mississippi River.

The number of cases on board the blockading and patrolling vessels treated during the war was 144,038; the number of deaths was 2532. The number of cases treated at hospitals and on board vessels in 1864 was 73,555. The number of naval men wounded in battle was 3266. Seventy-one men were supplied with artificial limbs. Most of the medicines used by the navy were prepared at the Naval Laboratory in New York City.[50]

The five Northern navy-yards were the great depots, manufactories and repair shops of the navy. Of these, the New York yard was by far the most important. Its location in the metropolis, where artisans, laborers and commodities of all sorts abounded, and its comparative nearness to the South, made it indispensable to the work of the navy. Here, in one year, one hundred and fifty-eight vessels were repaired, a much larger number than elsewhere. All the navy-yards were much improved, and their capacity for repairing vessels, storing supplies and performing naval work of various sorts was greatly increased. The artisans and laborers at the navy-yards increased more than fourfold. Toward the end of the war they numbered 16,880, and about an equal number of men were employed in private yards on work for the navy. The maximum number of men at the Boston yard was 3475. This establishment was enlarged by the purchase of additional ground. The docking facilities of the navy, which were quite inadequate, were improved by the construction of two floating dry docks, one for the New York yard and the other for the Philadelphia yard. Secretary Welles recommended the construction of several stone dry docks.[51]

In 1862 the Norfolk and Pensacola navy-yards were recovered by the Unionists, after the Confederates had destroyed most of

[50] Ann. Rept. of Bureau of Medicine and Surgery, 1862-1865; Ann. Rept. of Sec. of N., 1865, p. 387; 1866, p. 207; 1866, p. 302.

[51] Ann. Rept. of Sec. of N., 1865, xiii, xviii; Preble, Boston Navy-Yard, 43.

their buildings, stores, ordnance and machinery. The two yards were converted by the Unionists into naval depots and repair stations. At Pensacola but few improvements were made. Since the Norfolk yard was more strategically located, considerable progress was made in its restoration. The ruin that was here effected by the retreating Confederates is well depicted in the following account of Secretary of State Seward, who was a member of the party of Secretary Welles that visited Norfolk in May, 1862, shortly after its abandonment by the enemy:

> We landed at what was the navy-yard and is now a mass of smoking ruins. Long rows of crumbling walls, and roofless, empty, charred brick buildings, piles of still smoking ashes, docks and wharves torn up by gunpowder, wrecks of vessels burned to the water's edge, cover many acres. A Massachusetts regiment was encamped among the ruins, and one man, with a Yankee readiness, had contrived to establish a blacksmith shop out of the fragments, and was driving a successful business, mending guns and shoeing horses. A huge gun, burst in the middle, was recognized as one which a ball from the *Cumberland* destroyed on board the *Merrimac*, and Captain Dahlgren found it one of his own make. The soldier who stood guard over it asked me if I remembered, about eighteen months ago, reading in the newspapers of a Boston shoemaker, cruelly beaten and tarred and feathered in Savannah for supposed "abolitionism." I told him I remembered printing it in the *Albany Journal*. "I am that shoemaker," said he. "I enlisted in the first Massachusetts regiment I could find; and I have got so far on my way back to Savannah, to see those gentlemen again."

Not quite everything was destroyed. Of the buildings, the officers' quarters alone remained intact. A large number of iron tanks in good condition, considerable mast and ship timber, several old and worthless guns, and some machinery were left by the Confederates. The dry dock, which they attempted to blow up, was not greatly injured. On May 20, 1862, Captain John W. Livingston was made the first commandant of the restored yard, and he at once began to put it in order. Considerable property which had been taken from the yard and concealed was restored to him by citizens of Norfolk. Those shops that were most needed were at once repaired, and in 1863 the dry dock was made ready for use.[2]

Several naval depots and stations were maintained in the Southern states for the convenience of the blockading and patrolling squadrons. Here were to be found machinery for repairing vessels, ordnance of all kinds, provisions, coal and naval stores. Toward

[2] Seward, Seward, 90-91; Lull, Norfolk Navy-Yard, 60-62.

the end of the war there were stations or depots at Memphis, New Orleans, Ship Island, Key West, Port Royal, Beaufort and Baltimore. One of the earliest naval operations, made with a view to obtaining a foothold for a naval station on the Atlantic coast of the seceding states, resulted in the capture of Port Royal, South Carolina, which became the chief station of the South Atlantic blockading squadron. At one time more than two hundred vessels were safely sheltered in its harbor. Key West, which during the war presented a very lively appearance, was a rendezvous for all vessels going to and coming from the Gulf. Here they were supplied with coal and provisions, large quantities of which were constantly arriving from the North. This port was also the seat of a prize court, which passed judgment upon all vessels captured in the Gulf.

In the spring of 1862 Commodore Foote established a naval depot at Cairo, Illinois, under the command of Commander A. M. Pennock. Later, Mound City, Illinois, became the most important naval station on the Western waters. Carondelet, near St. Louis, was also an important river port for the navy in that region. During the war the establishment of a permanent navy-yard in the West was much agitated and discussed. Welles recommended it in 1862, and frequently thereafter. Foote believed that the need of a navy-yard on the Mississippi was very great, and the Western members of Congress were naturally much interested in the project. Finally, in pursuance of a joint resolution of Congress of June 30, 1864, Welles appointed a commission, with Rear-Admiral C. H. Davis as senior member, to select a location for the proposed yard. After examining various sites the commission recommended that a navy-yard of construction be located at Carondelet, and that Mound City be continued as a naval station for equipping and repairing vessels. This recommendation was not satisfactory, and when the war came to an end the site for a permanent yard on the Western waters was still undetermined.[88]

The transformation of the wooden sailing navy into an iron steam navy, in the opinion of Secretary Welles, rendered necessary the establishment of a navy-yard adapted to the new vessels. He believed that a yard containing foundries, steam machinery and steam machine shops for the repair and construction of iron ships, ironclads and iron shafting was imperatively needed. The

[88] Sen. Ex. Doc., 38 Cong. 2 sess., No. 19.

essentials for such an establishment were an abundance of fresh water, sufficient to float heavy ships, security from attack by an enemy and nearness to supplies of iron and coal. In March, and again in June, 1862, Welles invited the attention of Congress to this subject. The city of Philadelphia was greatly interested in the recommendations of the Secretary of the Navy and offered to donate to the government League Island, located in the Delaware River near the mouth of the Schuylkill, and comprising some 900 acres. The citizens of New London, Connecticut, also discovered an eligible site for a navy-yard in the vicinity of their city. On July 15, 1862, Congress passed a joint resolution authorizing the Secretary of the Navy to accept the gift of League Island, provided that he could obtain a good title to it and that a board of officers (which he was directed to appoint) should recommend its acceptance. The resolution assigned to the board the further duty of ascertaining the fitness for a naval depot and a navy-yard of the waters adjacent to New London and of those of Narragansett Bay. Evidently this resolution was a compromise between conflicting interests. A board, consisting of six members, of which Rear-Admiral Silas H. Stringham was president, was appointed by Welles on August 12.

After more than two months' labor, the board in the fall of 1862 made a report in which it considered the respective advantages of League Island, New London and Narragansett Bay. Its members were unanimous in their rejection of Narragansett Bay. Four members gave their preference to New London and the remaining two to League Island. Notwithstanding the opinion of a majority of the board, Welles, in his annual report for 1862, said that he proposed to accept the gift of League Island, unless Congress should otherwise direct. He argued that an establishment at New London would merely add another navy-yard of the same character as the old ones, while the acceptance of League Island would lead to the abandonment of the Philadelphia yard and the founding of a new establishment adapted to the needs of a steam and iron navy. Among the members of Congress each site found strong supporters, and the wheels of legislation were locked. For several years, the continued recommendations of Welles in behalf of the acceptance of League Island, the reports of Assistant Secretary Fox on the subject and the expressed desire of President Lincoln that League Island be promptly obtained were insufficient to move

Congress to action. Welles, in the end, concluded not to accept League Island without Congressional sanction.[54]

In August, 1864, Chief Engineer J. W. King was sent abroad to examine the dock yards, engine factories, rolling mills and iron-clads of Great Britain and France, and to collect information on these subjects with a view to aiding the department in establishing a modern navy-yard. King visited many of the public and private establishments of these countries, finding them superior to our own, and made a valuable report on his trip of inspection.[55]

The Civil War effected profound changes in the personnel as well as in the matériel of the navy. The legislation of this period respecting naval officers was the most important since 1798, and it still remains the basis of the organization of the navy. Measures for the amelioration and improvement of the service, which had been agitated for many years, were now passed, and the navy was placed more nearly on a par with the army, which service, since the founding of the government, had been more highly regarded by Congress and the people. The navy now acquired great prestige and popularity, and the names of its chief officers, such as those of Farragut and Porter, became household words.

During the winter of 1860-1861 the naval officers were more or less confused and demoralized by the conflict of their principles, interests and allegiances, by the disaffection towards the Union of many Southern officers, and by the lukewarm policy of the government in failing to defend its naval property. The *esprit de corps* of the service was greatly weakened and many officers joined the seceding states. The exact number who withdrew from the service has not been determined. Secretary Welles placed the number of naval officers who "traitorously abandoned" the flag at 322. A document in the archives of the Navy Department gives the names of 422 officers of the line, ranking from acting midshipman to captain, who left the service during the three years from December 1, 1860, to December 1, 1863. Several of these officers, however, chiefly of the lower grades, were from the North. The document gives the names of 15 captains, 35 commanders, and 99 lieutenants.[56]

[54] Ann. Rept. of Sec. of N., 1862, p. 32; 1863, xvii; 1864, xxx; U. S. Statutes at Large, XII, 575-576; Diary of Gideon Welles, I, 185, 207, 222.
[55] Ann. Rept. of Sec. of N., 1864, p. 1216.
[56] Congress Letters, XIV, 73-78; Ann. Rept. of Sec. of N., 1865, xiii.

A chief engineer of the United States navy became the engineer-in-chief of the Confederate navy. The several grades of the Confederate navy, except the very lowest, were filled almost entirely by former officers of the United States navy, who took rank in the new service according to their previous rank in the old. Several of these officers acquired distinction in the Confederate navy. The Southerners of the Union navy at the beginning of the war could, with equal honor, have chosen to serve either their own state or the United States, but those officers who, while wearing the uniform and drawing the pay of the Federal government, played into the hands of the Confederacy and were unwilling to protect the public property, which they had taken an oath to defend, were traitors. That there were such officers at both the Pensacola and the Norfolk navy-yard when they surrendered cannot be doubted. Seventeen officers who were attached to the Norfolk yard were rightly dismissed from the navy. It is noteworthy that but few seamen and non-commissioned officers went with the South. Almost to a man the enlisted personnel remained faithful to the old flag.

Owing to resignations early in the war and to subsequent legislation, the number of officers in the higher grades of the regular navy was not as large in 1865 as in 1861. The *Naval Register* for January, 1861, contains the names of 514 captains, commanders and lieutenants, on the active list; while the *Register* for January, 1865, contains but 379 names between the grades of lieutenant and vice-admiral inclusive. A considerable increase was made in the numbers of most of the regular staff corps of the navy. From 1861 to 1865 the engineers increased from 192 to 474, the surgeons from 148 to 208, and the paymasters from 64 to 96. The chaplains, however, decreased from 24 to 21.[57] Many officers on the reserved and retired lists were assigned to duty at naval posts on shore.

The great need for additional officers was met largely by the appointment of volunteers. During the first months of the war considerable pressure was brought to bear upon the government and the department to establish privateering, but it was successfully resisted. Massachusetts was anxious and importunate to organize an auxiliary navy of her own. Her motives were not wholly patriotic, as one of her objects was the obtaining of lucrative employment for her men and capital. Ex-governor G. S. Boutwell, representing Governor John Andrew, came to Washing-

[57] Navy Registers, 1861 and 1866.

ton to make the necessary arrangements for a Massachusetts volunteer navy. This plan, as well as several others of a similar character, did not meet with the approval of Secretary Welles and was not adopted. Before Congress met in July, 1861, Welles had commissioned many volunteer officers. An act of July 24, providing for a temporary increase of the navy, legalized Welles's past appointments and established a naval volunteer corps. The total number of volunteer officers employed from 1861 to 1865 was about 7500. Near the close of the war there were in the navy, as volunteers, 2060 line officers, 1805 engineers, 370 paymasters and 245 surgeons. The highest rank attained by volunteer line officers was that of lieutenant-commander.[58]

The volunteers to the naval line came chiefly from the merchant service. A few civilians, who had formerly been in the navy and had resigned, hastened to offer their services to their country in its time of dire need. Of this class was Captain John S. Barnes, who on December 5, 1860, tendered his services to the department in case of a war. Many of the inexperienced officers acquitted themselves with credit, zeal and fidelity, but unfortunately not all of them were fitted for the naval service. This was especially true of the engineer corps. One of the acting engineers, for instance, was a village schoolmaster from the up-country of New Hampshire, whose knowledge of marine engineering had been gained from a picture of a condensing engine in a text-book on natural philosophy common in the schools of New England. He introduced into the service one of his favorite pupils, whose knowledge of engineering was, if possible, even more rudimentary.

Naval officers who are well fitted for the mild duties of peace may fall far short of the sterner requirements of war. In 1861, upon the outbreak of hostilities, the department determined, for the good of the country and the navy, to retire all those officers who were incapacitated by old age, ill health and the enervation incident to service in the old navy. In the upper grades there was much deadwood. The officers at the head of the list of commanders were sixty years old, and some of the lieutenants were between forty-eight and fifty years. The department therefore obtained the passage of the act of August 3, 1861, providing for a naval retired list, according to which incapacitated officers were to be either

[58] Manuscript Papers of Gideon Welles; U. S. Statutes at Large, XII, 272-273; Ann. Rept. of Sec. of N., 1865, xiii; Navy Register, 1865.

retired or discharged. Those who were retired were to be ineligible for promotion, and were to receive reduced pay, at rates fixed for the several grades. A naval board of commissioned officers, two-fifths of whose members were to be naval surgeons, was to select the incapacitated officers. The act also provided that officers might retire voluntarily after forty years' service. Secretary Welles at once appointed the retiring board, with Commodore George W. Storer as president, and Commander David G. Farragut as one of its members, which assembled at New York on October 18, 1861. The board found comparatively few officers incapacitated, and its work was not altogether satisfactory to the department. It virtually constituted itself a naval court, and felt itself bound by the rules of evidence governing such courts.[59]

On December 21, 1861, additional legislation respecting retirement was enacted. All officers were now to be retired at the age of sixty-two years, or after having been forty-five years in the naval service. It was also provided that the officers on the retired list might be assigned to shore-duty. After the passage of this law, little additional legislation on the retirement of naval officers was enacted for forty years. In 1863 the number of officers of the line on the retired list was 67, and in 1865, 85. In the latter year there were 45 officers on the reserved list established by the naval efficiency act of 1855. The two lists were kept separate.[60]

From the standpoint of the naval line officer, the most important naval legislation of the Civil War, or indeed the most important since the navy was founded, was the law of July 16, 1862, entitled "An Act to Establish and Equalize the Grade of Line Officers of the United States Navy." Legislation similar to that of this act was recommended by President Lincoln and Secretary Welles in their annual reports for 1861. The first section of the new law brought the navy the boon of higher grades, which it had long sought. For the first time in many years Congress definitely specified the number of naval officers and the number of grades. The active list of line officers was divided into nine grades. In addition to the old ranks of captain, commander, lieutenant, master and midshipman, four new ones were established: the rank of ensign between the ranks of midshipman and master, that of

[59] U. S. Statutes at Large, XII, 290-291; Ann. Rept. of Sec. of N., 1861, p. 18.

[60] U. S. Statutes at Large, XII, 329-330; Navy Registers, 1863 and 1865.

lieutenant-commander between the ranks of lieutenant and commander, and the ranks of commodore and rear-admiral above that of captain. The number of officers established in each grade was as follows: rear-admirals, 9; commodores, 18; captains, 36; commanders, 72; lieutenant-commanders, masters, lieutenants and ensigns, each, 144. The number of midshipmen was not definitely fixed, but it was made to depend chiefly upon the number of members of the House of Representatives.

The act of July 16, 1862, made due provision for the filling of the new grades. It authorized the appointment of an advisory board of naval officers, which was to scrutinize carefully the active list and report those names that were deemed worthy of promotion. The officers recommended by the board were to be promoted and commissioned according to their seniority until the several grades, with the exception of that of rear-admiral, were full. During war, the nine rear-admirals were to be selected from those officers who had distinguished themselves in their profession by their courage, skill and genius. In peace, the rear-admirals were to be chosen according to the method of promotion obtaining in the other grades. The act further provided that a similar naval advisory board on promotions should be appointed every four years. It also established the relative rank of navy and army officers, and provided the navy with a new pay-table. The latter fixed the annual pay of a rear-admiral at sea at $5000, and of a captain at $3500.[a]

On July 22, 1862, the Secretary of the Navy appointed the first advisory board on promotions, which was composed of five naval captains, of whom Captain William B. Shubrick was the senior officer. It completed its work on August 6, and the officers whom it recommended were at once promoted. Those officers whom it passed over severely criticised its findings. They went to Congress for redress, and that body passed a bill for their relief, but the President refused to sign it.

On April 21, 1864, the law of July 16, 1862, was somewhat modified. An act was then passed providing for an examining board of three naval officers senior in rank to the officers whom it should examine. All naval officers below the grade of commodore were now required to pass both a mental and a physical examination before each promotion, in order to test their professional qualifi-

[a] U. S. Statutes at Large, XII, 583-587.

cations. This act further provided that officers might be advanced in their own grade, not exceeding 30 numbers, for distinguished conduct in battle or extraordinary heroism. The present system of naval boards for the retirement and promotion of officers dates from these acts passed during the Civil War.[62]

During the war the rank of rear-admiral was not entirely filled. On December 1, 1862, the President nominated four naval captains to be rear-admirals on the active list—Farragut, Goldsborough, Dupont and Foote—with commissions dating July 16, 1862. Later, Davis, Dahlgren and Porter were promoted to this rank. In December, 1864, Congress established a still higher grade, that of vice-admiral, and provided that one rear-admiral should be promoted to it. The sea-pay of the new office was $7000 a year. The position was created for Farragut, and he was at once nominated and confirmed as vice-admiral.[63]

The Navy Department was conspicuously successful in selecting officers for the higher commands. Its good fortune in this respect, as compared with the bad success of the War Department, was commented upon by President Lincoln. He thought that the qualities of the officers of the navy must run more evenly, and that the task of selecting officers for the higher commands must be less difficult, than in the army.[64] The Navy Department did no experimenting corresponding to that of the War Department with McClellan, Halleck, Hooker and Pope. Before the end of 1862 the naval officers who acquired distinction had already received the highest posts in the gift of the department. Even at this early date the roll of great naval names could have been made out—Farragut, Porter, Dupont, Foote, Davis, Dahlgren and Lee. Secretary Welles had an intimate knowledge of the capabilities of his commanders, and the diary which he kept during the war abounds with his estimates of their qualities. He seems to have closely supervised the naval operations. The planning of the operations was of course a composite work, in which the naval officers largely shared. In the summer of 1861 the Commission of Conference served as a Board of Strategy. Fox was always fertile in suggestions. The honor of originating the New Orleans expedition

[62] Congress Letters, XIV, 115-116; Ann. Rept. of Sec. of N., 1862, 40-41; U. S. Statutes at Large, XIII, 53-54.

[63] U. S. Statutes at Large, XIII, 420.

[64] Diary of Gideon Welles, I, 440.

is claimed by Professor J. R. Soley for Porter, although Secretary Welles, writing after the war, gave Porter a less conspicuous part. In the naval expedition of the fall of 1861, which resulted in the capture of Port Royal, its commander, Commodore Dupont, was permitted to choose the point on the Atlantic coast to be attacked. In all co-operative movements with the army, much consultation took place between the officials and officers of the two services. Sometimes President Lincoln took a hand in the direction of the fleet.

During the war the standard of naval education was somewhat lowered by reason of the exigencies of the service and the poor accommodations of the Naval Academy, which was moved from Annapolis to Newport early in 1861. In July, 1864, Congress recognized the increased importance of steamships in the navy by authorizing the instruction at the Academy of "cadet engineers." The volunteer officers received elementary instruction in gunnery and seamanship at the navy-yards. Before entering the service they had to pass an examination in seamanship, navigation and gunnery. They had also to undergo an examination for promotion. In 1863 Lieutenant S. B. Luce made a report on the English apprentice system, in which he recommended a similar system for our navy; and in the following year Secretary Welles, who was very favorably disposed towards the sailormen of the navy, ordered the enlistment of a number of apprentices and the fitting out of the *Sabine* as a school-ship for them. The new system was organized by Lieutenant-Commander R. B. Lowry. Welles recommended that one-half of the midshipmen appointed to the Naval Academy should be selected from the apprentices.[65]

At the outbreak of the war numerous recruiting rendezvous were opened on the Atlantic coast and the Great Lakes for the enlistment of seamen, and within three months the number of seamen in the navy was doubled. In order to procure the necessary crews at the earliest moment, and also with a view to inducing the sailors engaged in the fisheries and coastwise trade to enter the navy, the term of enlistment was reduced from three years to one. The effect of this reduction was to call into the naval service at New York a large number of recent immigrants who were not adapted to a seafaring life. Complaints of their inefficiency compelled the curtailment of enlistments of this sort.

[65] Ann. Rept. of Sec. of N., 1864, xxxv.

Early in the war sailors entered the navy promptly, and the ships were seldom delayed more than three or four days for want of crews. In the spring and summer of 1864 the situation was quite different. In March, 35 vessels were waiting for their complements and the navy was in need of more than 10,000 seamen. In June the Secretary of the Navy wrote that "our squadrons are becoming almost paralyzed for defensive, offensive, or blockading purposes, and calls on the department from all quarters for men are constantly made." Because of her depleted crew the steamer *Water Witch* had recently been compelled to surrender to the Confederates. The laws discriminated in favor of the enlistment of soldiers, and many sailors entered the army in preference to the navy in order to receive the bounties given to the recruits of the land service. Enlistments in the navy received little local encouragement, since the accounts of communities against the "draft" were not credited by the recruiting of seamen for the navy. When the war came to an end in 1865 the total number of enlisted men in the navy was 51,500, an increase of about 44,000 over the number when the war began. The total number of men recruited during the war was 118,044.[66]

In 1861 the number of officers and privates in the marine corps was largely increased. Twenty commissioned officers left the corps on account of their sympathy with the South. An act of July 25, 1861, for the better organization of the marine corps, provided for 93 commissioned officers and 3074 non-commissioned officers and privates. At the close of the war the number of enlisted men was about 3650. Two new posts were established, one at Cairo, Illinois, and the other at the Mare Island navy-yard. The barracks at Boston and Portsmouth were rebuilt.[67]

Throughout the war Secretary Welles and his management of the Navy Department were severely criticised and denounced. His critics asserted that he was a friend of red tape, that he was an extravagant administrator and that he was entirely too slow and deliberate for the strenuous duties of war. It may be said briefly in reply that Welles often cut the red tape unmercifully, that no business of the war was more economically conducted than that of the Navy Department, and that, all things considered, he extem-

[66] Ann. Rept. of Sec. of N., 1865, xiii, 200; Congress Letters, XIII, 371-372, 381; XIV, 101, 127, 188.

[67] U. S. Statutes at Large, XII, 275; Collum, Marine Corps, 115.

porized a navy in a remarkably short time. It is true that the department made at least one egregious blunder, the building of the light-draft monitors. Some frauds were perpetrated upon it, and certain administrative abuses flourished. On February 6, 1863, Rear-Admiral Dahlgren, then chief of the Bureau of Ordnance, wrote that the "pressure of private interests is enormous and rascally"; and again on March 3, 1864, that Washington was "all alive with crowds making money on the war." Politics was still the bane of the navy-yards, and it was often responsible for the selection of negligent and faithless employees. Workmen were assessed for party purposes, and sometimes the chief officers of the yards had imposed upon them the "duty of tax-gatherers for electioneering purposes." In 1865 Welles issued orders to prevent such assessments. Some of the abuses relating to the purchase of naval supplies the Secretary of the Navy ascribed to the law which compelled him to award the naval contracts to the lowest bidder, no matter if they could not be honestly fulfilled. On several occasions he asked Congress to remedy the defective system of making contracts.[68]

In 1864 both the Secretary of the Navy and a committee of the Senate made extensive investigations into alleged abuses and malpractices connected with the navy-yards and naval contracts. Colonel H. S. Olcott, who was employed by Welles as a special commissioner to investigate the navy frauds, discovered in New York City a ring of dishonest contractors who, by collusions with the employees of the navy-yards, were able to supply poor articles in place of good ones and thus make large profits. A contractor by the name of Stover had in one year cleared $117,000 by substituting "horse fat, menhaden and other stinking fish oils" for "best winter-strained sperm oil" called for by his contract. At Philadelphia Olcott caused the arrest of 31 men, most of whom were employees of the Philadelphia yard, and among whom were a naval constructor and a first assistant engineer. He recovered large quantities of stolen copper, pitch, rosin and naval stores. "To say nothing of copper bath-tubs, brass filings, and other small things, the thieves had removed a steam engine bodily and sold it to a junk dealer." Welles's investigation led to the dismissal of the commandant, storekeeper and two masters of the Washington

[68] Ann. Rept. of Sec. of N., 1865, xxv-xxvi; Dahlgren, Dahlgren, 387, 443; Diary of Gideon Welles, I, 404, 507, 523.

navy-yard. About $60,000 was restored to the government by men who confessed their guilt. Parties were tried and convicted, and were fined to the amount of $75,000. The Smith Brothers, contractors for naval supplies at Boston, were fined $20,000 and sentenced to two years' imprisonment. Their case was carried to President Lincoln by Senator Charles Sumner, who was convinced of the contractors' innocence. Sumner wrote an opinion based upon the evidence produced at their trial, in which he showed that, according to the findings of the court, the government had lost only $100 in transactions amounting to more than $1,200,000. Guided by Sumner's opinion, Lincoln disapproved the judgment and sentence, and directed that the Smith Brothers be released. The loss of the department through frauds, as compared with its total expenditures, was slight. This loss was probably much less than that of certain contractors for building ships, whose bids were too low, and who after the war appealed to Congress for reimbursement.[89]

Welles's own words, which occur in his annual report for 1868, may be taken as a just, concise and accurate statement of the department's achievements during the Civil War, and they may be appropriately quoted here, although they refer also to the later work of the department. Appearing shortly after his retirement at the end of Johnson's administration, they constitute his valedictory:

> It has fallen to my lot to sustain a greater responsibility, and to have had a much more eventful and varied, as well as a longer experience in this department than any one of my predecessors. While I claim no exemption from error, it is a gratifying reflection that the duties entrusted to me have been acceptably performed, and that the record which commemorates the services and achievements of our naval heroes, also bears evidence, through a most important period of our country's history, of a not unsuccessful administration of our naval affairs.
>
> On this department, soon after I entered it, devolved the task of creating within a brief period a navy unequaled in some respects, and without a parallel—of enforcing the most extensive blockade which was ever established—of projecting and carrying forward to successful execution immense naval expeditions—of causing our extensive rivers, almost continental in their reach, to be actively patrolled—and finally, after four

[89] Rhodes, History of the United States, V, 221-224; Congress Letters, XIV, 246-251; Sen. Rept., 38 Cong. 1 sess., No. 99; Annals of the War (publ. by the Pa. Weekly Times), 717-723; Diary of Gideon Welles, I, 483, 511, 540.

years of embittered warfare, of retiring the immense naval armament which had been promptly called into existence, of disposing to the commercial marine the vessels procured from that service, and of re-establishing our squadrons abroad in the interest of peace.

The waste of war is always great, but much of the expenditure of the Navy Department, which is but a small per cent of the national war expenses, is invested in navy-yard improvements, which are worth to the government all they cost, and in naval vessels and ordnance, which have at all times an intrinsic value. When the fact of this large amount of property left on hand, of the return of millions to the treasury, of the magnitude of the war, of the vast operations of the navy, and of the depreciation of the currency, and the consequently enhanced prices with which those operations were conducted, are considered, the economical and faithful administration of the Navy Department will be admitted.[70]

[70] Ann. Rept. of Sec. of N., 1868, xxxiv.

(TO BE CONTINUED.)

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

AN OFFICER OF THE OLD NAVY: REAR-ADMIRAL CHARLES STEEDMAN, U. S. N. (1811-1890).[1]

By CAPTAIN ALBERT GLEAVES, U. S. Navy.

Charles Steedman was born September 20, 1811, on his father's plantation in the parish of St. James, Santee, South Carolina. He was always intended for the sea, and when he was only eight or ten years old his father had his name entered on the list of applicants for a midshipman's appointment. At the age of fourteen he made a voyage to Liverpool in a merchant-ship, and upon his return served as a sort of acting midshipman in the Revenue Service. In 1828 he received his appointment in the navy, and entered the Naval School, which was then at the navy yard, New York.

Commodore Isaac Chauncey was the commandant, and the second in command was Francis Gregory, another officer of the War of 1812, who survived the Civil War. Steedman remained at the school eighteen months, and was then sent to sea in the *Natchez*, a 700-ton sloop-of-war commanded by J. T. Newton, who had been with Lawrence in the *Hornet*, when that ship fought and destroyed the *Peacock* in fifteen minutes off the coast of British Guiana, and who later distinguished himself with Biddle, when the same vessel captured the *Penguin*.

It will thus be seen that Midshipman Steedman's earliest associations were with a gallant lot of sailor folk, and he lived in an atmosphere that must have been saturated with stories of Paul Jones, and Manley, and Nicholson, and doubtless among his shipmates there were men who had sailed with men who had served under Barry, and Conyngham, and Truxton and Porter—not

[1] Memoir and Correspondence of Charles Steedman, Rear-Admiral, United States Navy. Edited by Amos Lawrence Mason, A. B., M. D., Harvard. 1912. Privately printed by the Riverside Press.

"Essex" Porter, but his father. And so this midshipman, who lived long beyond his three score years and ten, is a connecting link with the progeny that succeeded Dale and Mayrant, and of that period a lover of the navy has written: "I go back to the twilight time of Paul Jones, and Nick Biddle, and Preble, and old Isaac Hull and the rest with a feeling that I am in some sort their attorney before the court of last resort. The mists of the ocean envelop them. The moon beams and the stars shine for them by night. But the light of the sun, in the meridian of his glory, has failed somehow to blaze down upon the page that bears their names and deeds." And he adds: "Let us not forget the homespun sources of our being, nor the men who laid the sure foundations on which we stand."[2]

Unlike the midshipmen of that day in other navies, Steedman's service was in peace times, and it was many years before he received his "baptism of fire." He escaped battle, but not the perils of the sea, and in his first cruise he was nearly wrecked on a reef in the Caicos Passage. The *Natchez* joined the West Indian squadron, then commanded by Commodore Jesse D. Elliott, who in his day was one of the characters of the service. He it was who had gotten into a quarrel with Perry concerning Elliott's conduct at the Battle of Lake Erie, which provoked a bitter controversy that has only been paralleled in our own time. Elliott was tyrannical and unpopular, and was known as "Old Bruin." "Certain particular antient" stories of him have been handed down from generation to generation of naval officers, and have not yet altogether been forgotten.

After a short cruise in the Gulf of Mexico, the *Natchez* returned to Norfolk, and the midshipman had an opportunity of assisting in suppressing the Nat Turner insurrection. From the *Natchez* he passed to the *Fairfield,* cruising again in the Gulf and among the Windward Islands, having the usual experience of a midshipman in those latitudes, where society ranged from dinners and receptions at Government House to the dignity balls so graphically described by Marryat. In those days drills were few and short, and midshipmen whiled away idle hours by carving watch charms and cap visors out of tortoise shell. "O times! O customs!"

When the *Fairfield* returned to the United States, the Asiatic cholera was sweeping the country, and so many of the crew were

[2] Henry Watterson.

affected that the ship was put out of commission, and Steedman went home on leave. Charleston at that time was in the throes of nullification, and, with his father, the midshipman took an active part in the acrimonious politics of the day; society was volcanic, and the city was a city divided against itself; the first heated breath of the coming storm was in the air. The events of the time made a deep impression upon him, and henceforth he developed, so he writes, "a strong and unalterable Union sentiment, and hatred to those who wished to break up a glorious Union. The idea of owing allegiance to the State of South Carolina never from that day to this entered my head; I never hesitated for a moment what side to take, and when I found myself in command of one of the vessels attached to the expedition to capture Port Royal in my native state, I felt not the slightest hesitation in doing my duty, and banged away at the rebels with as much vim as I should have done if engaged with a foreign foe." This is a strong confession of faith.

When the midshipman's leave expired, he was ordered to the *Grampus,* a small schooner of 184 tons carrying 12 guns, and in her he again returned to the Gulf for a short cruise. So far his experience had not been exciting, but he had the fortune to meet such men as Sir John Franklin, Henry Keppel and Sir Charles Napier, and such women as the famous Madame Le Vert, of Mobile.

When the *Grampus* came north, Steedman was ordered up for examination for promotion to passed midshipman. The distinguished Commodore Jacob Jones was president of the board, and among the members was Captain Bolton, whose name suggests a story characteristic of the man and his times, when he was in command of the *Brandywine* at Cadiz. It was his custom to live ashore whenever his ship was in port, and at Cadiz he had engaged a villa on the outskirts of the town. The villa was leased by an English general officer who happened to be out of town when the *Brandywine* arrived, and who was not expected to return for several weeks. Naturally Bolton knew nothing of this. One day he and his staff were together on the screened veranda when a man in the dress of a Spanish hidalgo unexpectedly appeared, and in an arrogant and offensive manner said: "Whom have I the honor of meeting in my own house. *I* am Sir —— ——, late commanding the artillery in the expeditionary force to Acre, at present com-

manding Her Majesty's forces at Gibraltar." Bolton, not at all ruffled, replied coolly: "*I* am Captain William Compton Bolton, United States Navy, commanding the United States Frigate *Brandywine*"; then, turning to one of the midshipmen, he said: "Mr. Fairfax, find out what this person wants." Explanations of course followed, and the two afterwards became very friendly.

In December, 1835, the passed midshipman received coveted orders to the *Constitution,* then fitting out for the Mediterranean, and he joined her at New York. She had run down from Boston and put in to New York long enough to replace the head of Andrew Jackson, her figurehead, which it will be recalled had been sawed off one night in Boston by an adventurous sea captain named Dewey. Elliott, who had been commandant at Boston, had chosen a full-length figure of the President for the figurehead of the *Constitution,* and this had greatly incensed the people of Boston, who were largely Whigs. Whether the commodore had an eye to windward or not is as it may be, but he did get the Mediterranean squadron when "Old Ironsides" was slated for that station.

The cruise up the Straits was a famous one in its day, and it lived in the navy for many years on the stories that grew out of it. Ever since the navy was cradled on the Barbary coasts, the Mediterranean has been a favorite cruising ground for our ships of war, and until very recent years we habitually maintained a squadron there. In the old sailing days the ships wintered at Port Mahon, where there was a storehouse, and in the summer they cruised along the north coast of Africa, and among the Grecian islands. They bucked the mistral in the Gulf of Lyons and the bora in the Adriatic; the levanter was a constant companion from Gibraltar and Cape de Gata to Cape Bona and Malta. When steam became auxiliary, many ports that had been only occasionally visited before were included in the itinerary, and during a three years' cruise, if a ship had any luck at all, she was apt to visit every port of interest in the Mediterranean. The climax of the European cruises was reached in the summers in the North Sea and the Baltic. In the days of sail those waters were *maria clausa* to our ships, except when on special service, as when a frigate would be detailed to take aboard a minister or envoy or some highly specialized commission to straighten out diplomatic tangles at the Court of St. James or at St. Cloud. This was a custom that dated back to 1780, when the *Alliance* took Lafayette to France. It cannot be supposed that

such voyages, although not of infrequent occurrence, were altogether agreeable either for passengers or for the people of the ship; for quarters were constricted in those days, and the generally turbulent western ocean, together with adverse winds, usually prolonged the average crossing into a question of weeks. On one of these occasions of a *voyage de ceremonie*, three commissioners, one of whom was Henry Clay, were sent to Holland in the *John Adams*. One day, following an ancient custom of the sea, they were persuaded by some midshipmen to go aloft in the maintop, and of course the topmen demanded the same toll as when crossing the line for the first time. Two of the gentlemen accepted the situation and promised grog and tobacco, but Mr. Clay became angry and demanded that the lines which had been passed across the lubber's hole be removed. He complained to Captain Angus that he had been treated with great disrespect, and, because the captain would not punish the men, Clay never forgave him, and his resentment, so it is written, pursued the captain throughout his whole career.

But to return to the passed midshipman. For three years he cruised in the Mediterranean, most of the time in the flagship. His journal of this period is very interesting; there were plenty of hard gales of wind at sea, gay times ashore, and love-making on board, especially when General Cass, our minister to France, and his family cruised to the Levant as the guests of the commodore. He writes of excursions to places *toto cælo*, London and Jerusalem and Paris and Cairo. He heard grand opera in Spain and Italy, and he caught a glimpse of the civil war in Portugal. He was presented to Pope Gregory in the Vatican, and he acted as second in a duel between two midshipmen at Smyrna. But over all his adventures afloat and ashore hovered the grim figure of the taciturn old commodore. Many stories told of that remarkable man were doubtless fables, or applied to him from other sources. One of them, for instance, is at least as old as Rabelais, and may be found in the adventures of Pantagruel. Commodore Elliott was undoubtedly a good seaman, but he had none of the attractions of Smollett's Commodore Trunnion, for instance, whose epitaph records that "he never turned his poop to the enemy," and Steedman relates several stories which illustrate a type of sea officer as extinct now as the famous bird of Mauritius, but which had not altogether disappeared within the memory of those still living.

Steedman, as has been stated, came under his command in the West Indies, and his first experience with him was characteristic. The flagship came into Matanzas one day, and finding the *Natchez* there, Elliott immediately ordered her to sea. Captain Newton, however, persuaded him to allow the ship to remain long enough to give a ball the next evening, for which invitations were already out. The entertainment proved to be an all-night affair, and when it was over, no attempt was made to undress ship and all hands were allowed to sleep in. The commodore had accepted an invitation and came on board; and when he went over the side, he thanked the captain graciously for a pleasant evening. But he was no sooner on board his own ship than he signalled the *Natchez:* "Get under way with all dispatch." All hands were turned out, the decorations were hurriedly torn down, and the ship got ready for sea. And then, when Captain Newton signalled that he was ready, the commodore replied that the *Natchez* might remain at anchor.

In the duel referred to above, one of the midshipmen was severely wounded. When the commodore heard of the affair, he transferred the wounded midshipman to the crowded steerage of a small schooner, and kept him there until the fleet surgeon protested. For this act of cruelty and some other offenses, Elliott was later tried by court martial and sentenced to four years' suspension.

Once, while General Cass was on board the *Constitution,* the ward room gave a dinner to the minister and his family, but purposely failed to invite the commodore, which, to say the least, was not diplomatic. At the time, the ship was bound for Alexandria, and a party had been made up to visit Cairo. When the ship arrived at Alexandria, the commodore and his guests went ashore on an excursion to the Pyramids, but he ordered the ship to cruise off the port until he returned.

It was Elliott who brought home in the *Constitution* a number of jacks for breeding purposes. The officers were mortified and indignant at having "Old Ironsides" turned into a cattle-ship. It is related that when the *Constitution* went into port a donkey's head was out of every port alongside a gun, and Steedman solemnly records that at Malta, where there was a squadron of English men-of-war, at every gun fire, morning and evening, the asses set up a braying that was heard all over the harbor.

And here the irascible commodore vanishes from this sketch.

He came before the public prominently in 1820, when he seconded Barron at Bladensburg in the duel with Stephen Decatur.

After the cruise in the Mediterranean, Steedman joined the *Macedonian* and was flag lieutenant to Commodore Shubrick, and the summer of 1839 was passed on the New England coast, Newport being the rendezvous of the squadron. At that time Newport was a favorite resort of South Carolinians and a very different place from what it is now. The cliffs were not built up, and there were only a half-dozen houses on Kay Street. One of these was the residence of the widow of James Lawrence, who lived there until her death in 1865, having survived her distinguished sailor husband more than fifty years. It may not be out of place to relate an interesting recollection of this old lady. A short time before her death, she exhibited to Admiral Luce, then a young officer, a portrait of Captain Lawrence; and losing for a moment an appreciation of the intervening years, and regarding the lieutenant-commander as a contemporary of her husband, she said: "Luce (she always addressed him thus), don't you think that looks very much like James?"

In 1841 Steedman was married, being old enough at the time to escape Lord St. Vincent's dictum, that a young officer married is damned for the service, and about the same time he became a full lieutenant, thereby following the advice, albeit by chance, of another ancient of the sea, "never to marry before you are thirty, or before you are a lieutenant." Shore duty followed for a few years, and then he went to the *St. Mary's* and so back to the Gulf and into the navy's share in the war with Mexico. In a journal otherwise full of incident and anecdote, it is strange that there is no mention in the memoirs of the execution on board the *St. Mary's* of a sailor who had been sentenced to be hanged for striking one of the watch officers. It was the last hanging at the yardarm in the navy, and following, as it did, only a few years after the execution of Midshipman Spenser on board the brig *Somers,* it produced a profound impression in the country. One of the midshipmen on board the *St. Mary's* at the time, the present Rear-Admiral Upshur tells the story in the most vivid and interesting manner, with a wealth of detail that sounds like a chapter out of Marryat.

Routine details succeeded the service in the *St. Mary's,* and in 1855 Steedman was promoted to commander, and in the Para-

guayan expedition he commanded the brig *Dolphin,* of 224 tons and six 32-pounders, not much of a craft according to modern standards, but a satisfactory command in those days. The Paraguayan expedition was sent out to vindicate the majesty of the flag. In 1855 the steamer *Water Witch,* commanded by Lieutenant T. J. Page, while trying to make Asuncion on a diplomatic mission, was fired upon by a Paraguayan fort, and the man at the wheel was killed. The affair became the subject of prolonged correspondence, but as no satisfaction was obtained, Congress at last authorized the President to use force. An expedition consisting of 19 ships, 200 guns, and 2500 men under the command of William B. Shubrick, who flew his broad pennant on the *Sabine,* was sent to the river Platte in 1858, with the result that the navy succeeded where diplomacy had failed, and, as it happened, without the necessity of resorting to extreme measures.

When Steedman returned to the United States, war clouds were beginning to darken the horizon. There is a Dutch proverb that says froth is not beer; and until 1861 life in the navy, as a rule, had not been over-serious, but henceforward everything was to be changed. It is below the horizon of this article to discuss the questions that tried, as never before or since, the hearts of the men who bore commissions in the United States service; and it is impossible for us who live in later and peaceful times to pass judgment on those officers who went south, believing that their allegiance was to their native states. We have their experience as a guide, but they faced a new condition without precedent, and they decided according to their conscience. When the war was over, and the vexing questions had been settled by sword and gun, many of them must have recalled the inexpressibly sad words of Pascal, *"s'il le jeunesse savait; si la vieillesse pouvait."* General Lee's opinion on this subject is worth repeating and worth remembering: "I can anticipate no greater calamity for the country than a dissolution of the Union. It would be an accumulation of all the evils we complain of, and I am willing to sacrifice everything but honour for its preservation. Secession is nothing but revolution. The framers of our Constitution never would have exhausted so much labour, wisdom and forbearance in its formation, and surrounded it with so many guards and securities, if it were intended to be broken by every member of the confederation at will." But Lee left the Union because Virginia left it, and he felt that Vir-

ginia was his country; and I cannot see how any citizen of the old colonial states, with all the memories of and traditions of his forefathers in his heart, and all the local attachments and fellowships that constitute home, can fail to sympathize with such an attitude.[3] He clung to Virginia, to use the words of another, as a son clings to an erring mother. So, like Moses, "he refused to be called the son of Pharaoh's daughter, choosing rather to suffer the afflictions of his own people."

But Steedman had no difficulties of this kind. To him the path had been plain and straight for years, as we have seen. He kept the faith, without fear of ostracism by those who had been lifelong friends. There is an amusing story that illustrates the intense feeling in the South against those Southern officers who remained loyal. While operating in the Carolina sounds, Captain Bankhead, a native of North Carolina, one day received a package accompanied by a note to the effect that the sender was presenting him a family heirloom, in the hope that it would soon be of service. The gift was a set of silver coffin handles.

It is to be remembered that although the Southern naval officers had wonderful opportunities of affording the greatest assistance to the Confederacy by taking their ships into Southern ports, not one did so. In the "Rise and Fall of the Confederate Government," Jefferson Davis says: "The Southern officers of the navy who were in command of United States vessels abroad, under an idea more creditable to their sentiment than to their knowledge of the nature of the Constitution, brought the vessels they commanded into the ports of the North, and having delivered them to the authorities of the United States government, generally tendered their resignations and repaired to the states from which they had been commissioned in the navy, to serve where they held their allegiance to be due . . . . While we honor the sentiment which caused them to surrender their heart-bound associations, and the profession to which they were bred, on which they relied for subsistence, to go with nothing save their swords and faithful hearts to fight, to bleed, and to die if need be, in defense of their homes and a righteous cause, we can but remember how much was lost by their view of what their home and duty commanded . . . . Therefore we were without the accessories needful for the rapid supply of naval vessels."

[3] Lee, the American. Bradford.

It is not our purpose to follow Captain Steedman through the Civil War further than to note the fact of his meritorious service and the confidence he inspired in his seniors. At the battle of Hilton Head he particularly distinguished himself and won the commendation of that sea-hero, Dupont, by his valor, decision and energy. At Port Royal, St. John, Fernandina, in the tiresome days of the great blockade, and in the attacks on Fort Fisher, he was always at the front, *facile princeps* whenever there was danger or hard fighting. His individual service was not spectacular, nor was it in any sense epoch-making, but it was all part of a great whole which contributed to the success of the Union cause and preserved the nation's life. The work of the navy during those four years has never been properly appreciated. In the diary of Secretary Welles he constantly laments that the navy was overlooked and neglected, and mentions a New York paper which, in its account of the fall of Fort Fisher, did not even refer to the navy. The blockade of the coast—the most extensive blockade in history, during which 1000 vessels were captured, valued at thirteen million dollars receives scarcely more than a passing notice in current histories of the war, and Rhodes' History of the United States, in seven formidable volumes, practically ignores the navy; he allots thirteen lines to the *Alabama-Kearsarge* action, and one line to Farragut's exploits at New Orleans. President Lincoln, however, was not unmindful of the sailors, and in a letter to a gentleman in Illinois he wrote, in his quaint and impressive style, " Nor must Uncle Sam's web-feet be forgotten. At all the watery margins they have been present, not only in the deep sea, the broad bay and the rapid river, but also the narrow bayou; and wherever the ground was a little damp they have made and left their tracks." Nor did Oliver Wendell Holmes forget the navy, for, referring to the action between the *Monitor* and the *Merrimac*, he wrote that it was an age of fables, heroes and demigods.

Steedman began his Civil War service auspiciously by rescuing a transport with a regiment of troops on board, in a gale of wind off Hatteras, while en route with the Port Royal expedition. At the battle of Hilton Head, Steedman led the starboard column in the *Bienville* and received the first fire of the forts at Bay Point. After passing the point, observing that Tatnall's gunboats were approaching from Skull Creek, he headed for them, and with a heavy fire drove them back into shoal water. Almost at the same

time the admiral signalled "Close order in line ahead," and then "Follow my motions with or without signal," but only one vessel, the *Susquehanna,* obeyed, and Steedman at full speed rejoined the fleet, and followed in the wake of the *Susquehanna.* When the battle was over in the afternoon, Steedman was complimented by Admiral Dupont on his conduct, but somehow the admiral did not mention him prominently in his report, and, twenty years after, a controversy was precipitated by the publication of a garbled account of the battle which put Steedman on the defensive.

His transfer to the *Paul Jones* soon followed, and his next action was in the attack on Fort McAllister. In the fall of 1862 he was assigned to the command of the forces in St. John's River, and his operations resulted in the occupation of Jacksonville. In the spring of 1863, Steedman having been promoted to captain was transferred to the *Powhatan* off Charleston, and with the ironclads took part in Dahlgren's attack.

In October, 1863, he was ordered to the *Ticonderoga* and was sent in pursuit of the *Florida,* but the cruise was futile. From Hampton Roads he went to St. Thomas, thence to Maranhan, and so on to Granada, and finally to Curaçao; but seeing nothing and hearing nothing of the will-o'-the-wisp, he returned to St. Thomas and then back to the coast.

On December 30 occurred the first attack on Fort Fisher, and on the 13th of January the second attack. In both the *Ticonderoga* took a prominent part. This was the termination of his war service, and the end of the great war.

Now it was all hands secure ship. The war was over, and the decks had been seriously cleared for action the last time for many years to come; the irksome days of blockading were over, the strain and fret of war were forgotten "or only remembered to make sweet the hour that o'er paid them." When next the country was to appeal to the *ultima ratio regum,* the guns were to be served by another generation.

The war-navy was disbanded and sold and reduced to a peace footing, and the cruising squadrons were re-established, to continue so for many years. There were six, all told, the North Atlantic, and the South Atlantic (called by the old-timers the Brazil squadron), the North and South Pacific, the European and the Asiatic. Of these, the favorite was of course the European, the cruise "up the Straits" being esteemed the best of all, and then came next in

popularity the North Atlantic or home station. It doesn't seem so very long ago since the flagship of the North Atlantic—the *Powhatan* or the *Tennessee*—alternated between the farewell buoy off Tods Wharf, at Norfolk, and the anchorage off the Battery, and rarely left the coast except for a brief winter's cruise in the West Indies.

In the Mediterranean the fleet rendezvous was Villefranche, where the United States maintained a storehouse, and there the flagship could usually be found during the winter months. In the summer she cruised in the English Channel and the Baltic.

Admiral Goldsborough was given the command of the European station, with the *Colorado* as his flagship, and about Christmas time, 1865, Steedman joined him at Villefranche in the *Ticonderoga*. It was an interesting cruise, and Dr. Gunnell, the late surgeon-general of the navy, writes, " he had with him a company of young officers of gallant war service," and adds parenthetically, "*not a married man among them.*" The cruise was continued for two years. It was a time of great events in Europe, for the war was on between Prussia and Austria and Italy. The *Ticonderoga* was at Trieste when the news of the battle of Sadowa arrived, and later of the victory at Lissa, and she took part in the royal welcome to Admiral Tegethoff upon his return to Trieste.

There was not much squadron work in those days. The school of the ship prevailed, and if the routine seems slack from our modern and strenuous point of view, it must be remembered that it was fully up to the requirements of the time, and there were no ships in the Mediterranean that could beat us in sail or spar drill. These drills were constantly exercised, receiving more attention than the guns, and to illustrate the fact that there was hard work in those days—although not so much of it—it may be recalled that at spar drill one day on board the old *Vandalia,* when lower yards and topmasts had been sent down, only to be sent up again immediately, the mainmast was overheard to remark, " Thank God, we can't live always." In his history of the Civil War, the Comte de Paris said that our ships had won an enviable reputation for cleanliness and smartness, their bright work shone like gold and their decks were white as shark's teeth. Officers and men were smart and up to all their duties. They were keen, too, for another fight, which many people of sane mind thought not far off. The captain of the *Kearsarge* cruising in the Pacific was so sure of war that he kept

the inside of his gun ports painted black, so that when he went to quarters and opened his ports the fact could not be readily distinguished by a suspicious enemy. But this *dolce far niente* cruising had advantages that are impossible now. It gave those who wished it the opportunity of continuing the education that had begun at the Naval Academy; very many men of that date studied art, music, and the languages, and while none, so far as is known, ever became *maestros,* not a few achieved enviable reputations as artists, linguists and musicians. These latter were exceptional of course, but in those days nearly every one at least read, and the taste for reading and the love of good books, and more or less familiarity with the best authors were not uncommon. The result was a class of unusually cultured men. It will readily be understood what a premium was placed on the cruise in the Mediterranean.

Those were the days, too, when captains were not forbidden to have their families with them on board ship; this custom may or may not have appealed to other officers, but it is certain that it did not universally please, and Secretary Welles speaks at length of the trouble it gave the department. One officer, as well known, and in the same way, as " Mad Jack " Percival was, wrote a mock-serio-official letter to the Navy Department stating that he had no wife, but that he had a grandmother, and requested that she be permitted to sail with him, as the sight of an old lady in an arm chair on deck knitting could not fail to have a refining influence upon the crew.

Steedman was promoted to commodore in 1868 and shortly afterwards returned to the United States. His next duty was at Boston, where he remained three years as commandant of the navy yard. It was congenial duty in the midst of congenial surroundings, and the commodore found pleasure and satisfaction in coming in contact with men like Agassiz, Dr. Holmes, and Longfellow, who made much of him, finding an interesting and attractive companion in the dignified, gracious sea-officer. In 1872 he was ordered to command the South Pacific station, where he flew his flag on the *Pensacola* for an uneventful year, and then having reached the statutory limit of service, he was retired. He survived his retirement for many years, which for the most part he passed in Washington in the ease and comfort of his club, and in writing his memoirs.

He was a man of considerable ability, and his letters show not only that he was susceptible to warm attachments, but that he was also of a deeply religious nature. As has been said of President Buchanan, he was courtly, dignified and studiously correct in dress, deportment and social intercourse. He knew the best people everywhere, and, unlike Major Pendennis, he did not seek their society, but they sought his. In the closing pages of Dr. Mason's book, there is a drawing by Hinckley of the admiral and Colonel Jerome Bonaparte playing chess at the Metropolitan Club, surrounded by a group of distinguished men, which gives an excellent idea of him and some of his contemporaries.

Admiral Steedman may be regarded as a type of what is commonly called the old school. He belonged to a past generation of naval officers. Dr. Shippen of the navy, a cherished friend and shipmate, wrote of him as "a most decided person, brave as a man in his profession should be, having strong views and always doing his duty as he saw it, and requiring everybody else about him to do his. A rather choleric and peppery commander withal, but one who, whenever he found he had been in error, always made reparation at once and in public. Not infrequently has he been known to apologize upon the quarterdeck in the presence of both officers and men for having hastily found fault with some junior officer . . . . Enjoying heartily the good things of life, he always had his table as well served as circumstances permitted, and he preserved the same refinement in its appointments, whether there was blockade beef and sherry or boned turkey and champagne"; and he adds, "he was a perfect lion in voice and bravery in storm and battle."

Even as he measured up to all the standards of an officer, so also he filled the qualifications of a Fellow of All Souls College, Oxford, inasmuch as he was *bene nati, bene vestiti et mediocriter docti.*

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A STUDY OF THE DEVELOPMENT OF THE METHOD OF FINDING A LINE OF POSITION.

By COMMANDER GEO. R. MARVELL, U. S. Navy.

It has been said "The easiest method is the one that was first learned." That is true for the person who is contented to keep in the rut, but for those who are inquisitive, progressive, or not satisfied with what they know, but want to know more, it is not true.

It is also said there is nothing new in navigation. This is true if it refers solely to the solution of the astronomical triangle, but when it comes to the methods of solution and the application of the parts found to the practice of navigation then it is not true.

Captain Sumner, as we all know, discovered the fact that if in working a time sight for longitude two or more latitudes were assumed, the resulting positions, if plotted on a Mercator chart, would all lie on the same straight line. This was really a discovery for it came when he was trying to fix his position, entering the English Channel during foggy weather. This method is now known as the chord method of finding a line.

The French Admiral Marcq St. Hilaire brought into general use in the French Navy his method of finding a line, which we now know as the tangent method.

It is well understood that it is impossible with a single sight of a heavenly body to fix exactly a ship's position. This can be easily explained by the fact that, after leaving a known spot, the current, course, and speed can only be approximately known, therefore the position by dead reckoning becomes more and more uncertain as the time and distance increase. In the astronomical triangle, when a heavenly body is observed, we have with reasonable accuracy the altitude and the declination, but no other data, for if we use the time sight formula, latitude has to be assumed; if we use ϕ'' ϕ', the longitude; and, if the altitude formula, the latitude and longitude.

The use of the compass azimuth cannot be considered at all owing to the imperfection of the instruments of observation and lack of knowledge of the exact variation at any particular point. It might

be said that in case the gyroscopic compass becomes as perfect as it bids fair to be we may be able to use the compass azimuth, Z, in finding our position.

The older officers in the service were taught at the Naval Academy the method of finding a Sumner line by means of two time sights, using two assumed latitudes. As the years rolled by, the later graduates were taught that the Sumner line could also be obtained by working one time sight and taking the azimuth of the body from the tables; and all were taught that these methods were only applicable when the hour angle was greater than $22\frac{1}{2}°$. The present graduates are not only taught the above, but also that the line can be obtained by assuming a latitude and longitude, finding the altitude, h, by formulas and the azimuth from the tables or from a diagram or nomogram. All were taught that by assuming two longitudes and by using the ϕ'' ϕ' formulas a line and position could be obtained when the hour angle was less than $22\frac{1}{2}°$.

Now, to sum up the methods of finding the coordinates of a line, we can use:

(1) Time sight formula assuming two latitudes, result two longitudes. Chord method.

(2) Time sight formula assuming one latitude, result one longitude and azimuth. Tangent method.

(3) ϕ'' ϕ' formulas assuming two longitudes, result two latitudes. Chord method.

(4) ϕ'' ϕ' formulas assuming one longitude, result one latitude and azimuth. Tangent method.

(5) Altitude formulas assuming latitude and longitude, result one altitude and azimuth. Tangent method.

These five methods are rigorously exact as far as the solution of the triangle is concerned. The formulas as obtained directly from the triangle are as follows:

(1) $\sin \frac{1}{2}t = \sqrt{\cos s \sin (s-h) \sec L \operatorname{cosec} p}$

(2) $\sin \frac{1}{2}t = \sqrt{\cos s \sin (s-h) \sec L \operatorname{cosec} p}$

$\cos \frac{1}{2}Z = \sqrt{\cos s \cos (s-p) \sec L \sec h}$

(3) $\tan \phi = \cot d \cos t$

$\cos \phi' = \cos \phi \sin h \operatorname{cosec} d$

$L = 90° - (\phi \pm \phi')$

(4) $\tan \phi = \cot d \cos t$

$\cos \phi' = \cos \phi \sin h \operatorname{cosec} d$

$$L = 90^\circ - (\phi \pm \phi')$$
$$\cot Z = \cot t \cos (L+\phi) \operatorname{cosec} \phi \text{ or } \sin Z = \cos d \sec h \sin t$$

(5) $\sin h = \cos (L \sim d) - 2 \cos L \cos d \sin^2 \frac{1}{2} t$
$\tan \phi = \cot d \cos t$
$\cot Z = \cot t \cos (L+\phi) \operatorname{cosec} \phi$

The above formulas are the original ones from the triangle and can be solved with any log table. Now let us see what changes in these have been made to permit an easier solution of the problem.

(1) This formula has been changed to

$$\text{haver } t = \frac{\sqrt{\text{haver } [z-(L-d)] \text{ haver } [z+(L-d)]}}{\cos L \cos d}$$

and a special table of haversines has been devised.

(2) haver $t = \sqrt{\text{haver}[z-(L-d)]\text{haver}[z+(L-d)]} \sec d \sec L$
haver $Z = \sqrt{\text{haver}[p-(h-L)]\text{haver}[p+(h-L)]} \sec h \sec L$

(3) $\phi = 90^\circ - \phi''$
$\tan \phi'' = \tan d \sec t$
$\cos \phi' = \sin \phi'' \sin h \operatorname{cosec} d$
$L = \phi'' \pm \phi'$

(4) $\phi = 90^\circ - \phi''$
$\tan \phi'' = \tan d \sec t$
$\cos \phi' = \sin \phi'' \sin h \operatorname{cosec} d$
$L = \phi'' \pm \phi'$
$\cot Z = \cot t \sin (\phi'' - L) \sec \phi''$

(5) haver $\theta = \cos L \cos d \text{ haver } t$
haver $z = \text{haver } (L \sim d) + \text{haver } \theta$
haver $Z = \sqrt{\text{haver}[p-(h-L)]\text{haver}[p+(h-L)]} \sec h \sec L$

The above formulas simplify the actual computation considerably and therefore should be used in place of the first set. The haversine tables then are the first help in the solution. The parts of the triangle which have to be found with the greatest accuracy are t, L and h, because it is upon them that the position of the ship depends. The other part Z is at present only used for determining compass errors.

As the instruments provided on board ship, the compass and azimuth circle, are scientifically crude, not reading closer than even degrees, although interpolation can be made to 15′ of arc, it can readily be seen that tables and diagrams of reasonable size can be constructed so that the value of Z can be found well within the error of 15′. Therefore the next step in the simplification of work-

ing out a line of position would be the construction of the above tables and diagrams, and these have been constructed where the given parts of the triangle are L, d and t. These eliminate all formulas for finding Z.

In (1) we have no need of Z.

(2) The data gives us L and d and the solution t, therefore the tables can be used for Z.

(3) There is no need of Z.

(4) The data gives t and d, the solution L, and the tables can be used.

(5) The data gives t, d and L, and the tables can be used.

The azimuth tables were therefore the second short cut or help.

The next step was the construction of diagrams and nomograms for the finding of the azimuth or Z, and thus do away with the azimuth tables. This has been done.

It would be of the greatest use if it were possible to construct tables so that in (1), (2), (3) and (4), having obtained the data, we could look in a table and pick out the corresponding answer t, or L, the local apparent time, or the latitude.

But stop and consider not only the tremendous amount of work that would be necessary to calculate such tables, but the size of the volumes when completed. About thirty million triangles would have to be solved for one latitude, d and h varying 1′ between 0° and 90°, and about three hundred thousand million triangles if L varies 1′ between 0° and 90°. We can therefore say that these tables are impracticable and that this method must be one of calculation solely.

The next improvement to facilitate the working up a line would be to have tables to find h and Z in place of the formula (5). Z is already arranged for in the azimuth tables and diagrams.

Tables for which h could be *exactly* picked out would be large and unwieldy, therefore we must consider the advisability of using tables when the value of h can only be approximately obtained.

It is necessary to determine the nearest approximation that will answer the requirements of navigation. We have seen that $\pm 15'$ are sufficient in the case of Z, owing to the crude instruments we use. In measuring the altitude of a celestial body at sea we use either a sextant reading to 10″ (high grade) or one reading to 30″ (surveying). The latter is more commonly used. Therefore in the first case we can have an error of $\pm 5''$ and in the latter $\pm 15''$.

The correction for dip without refraction can of course be accurately determined, and for every change of 3 feet in the height of the eye of the observer, from 10 feet to 50, we have a change in dip of from 30″ to 12″. If the observer's platform is absolutely steady then the dip, neglecting refraction, would be known, but as the ship is usually rolling and pitching more or less, thus giving an unsteady platform, it can be safely said that 6 feet would be an average change. This causes an error of from ±12″ to ±30″. Combining the least of these with the least of the sextant we have ±17″. Assuming a personal error of ±15″, which is very small, and an error in the refraction, which of course affects dip, of ±15″, we find that the error of an observed altitude, no matter how carefully taken, will be ±47″.

Therefore if tables can be constructed in which, when entered with L, d and t, the value of h can be picked out to the nearest five-tenths (0.′5) of a minute of arc, these tables will be well within the limit of error. Such tables have been constructed and both h and Z can be obtained with ease. There are a number of them. Ball's tables are straight away, entering with the values of L, d and t given in the data, h is by interpolation picked out, and, by renaming the columns, Z is obtained.

Other tables are Guyou's Nouvelles Tables de Navigation, Pes' LeRette di Posizione, and Aquino's Altitude and Azimuth Tables.

These tables now bring us to a new phase of the problem, viz.: "How close must the data be to obtain results within the limit of error of observation?"

Navigators agree that when two observers take an observation of the same object at approximately the same time, *i. e.*, within a few seconds, using their own observed altitudes and G. M. T. of their observation, their results may differ by at least 1½′ of arc or 6ˢ of time.

Therefore if tables are devised that will permit the finding of h within ±1′; they will answer the purposes of navigation.

In finding h from Ball's tables, interpolation, similar to the method we use in picking out Z from our azimuth tables, is employed, and the same for Z. This requires three multiplications and a combining of results in each case, making six operations in all.

In Guyou's tables the effect of the curvature of the earth is taken into account, two volumes are necessary to work from, and the method is of too great a refinement for the navigator.

In Aquino's tables two openings of the book, two multiplications and two simple formulas are necessary to get the result of h and Z.

From all this it is seen that the trend towards simplifying the work has been along the line of recognition of the fact that results cannot be any closer to the true result than the data issued is in error on the true data.

Now let an examination be made of the error in results caused by the taking of data approximately true. To do this an observation of the sun will be worked out in the most rigorous manner in order to compare the other results with it.

On March 27, 1912, in D. R. Lat. 39° 45′ N., D. R. Long. 52° 30′ W., observed the sextant altitude of ☉ to be 36° 48′. I. C.+2′ 00″. Height of eye 35 feet. W. 2^h 43^m 15^s, C.-W. 3^h 52^m 20^s. Chro. error fast or (+) 12^m 16^s.

h m s	° ′ ″	′ ″	° ′ ″	″
W. 2 43 15	☉ 36 48 00	I. C.+ 2 00	Decl. 2 34 02.5	H. D. 58.71
C.—W. 3 52 20	11 04	D.— 5 48	6 15.0	H. D. 58.57
C. 6 35 35	⊖ 36 59 04	R.— 1 18	*d* 2 40 17.5N	.14
C. E. +12 16		P.+ 7		.006
G. M. T. 6 23 19	Mch 27	S. D.+16 03		.02
Eq. t. 5 27.4		+11 04		58.69
G. A. T. 6 17 51.6				6.39
		Eq. t. 5^m32.30	H. D. .767	352.14
		4.90	6.389	17.61
		5 27.40	4.602	5.28
			.230	375.0
			61	
			7	
			4.90	

h	36° 59′ 04″		sec. .09757
L	39 45 00N	sec. .11416	sec. .11416
p	87 19 42.5	cosec. .00047	
2*S*	164 03 46.5		
S	82 01 53.2	cos. 9.14181	cos. 9.14181
S—*h*	45 02 49.2	sin. 9.84984	
S—*p* (—)	5 17 49.3	9.10628	cos. 9.99814
	h m s		
L. A. T.	2 47 31.0	sin. 9.55314	9.35168
G. A. T.	6 17 51.6		
Long.	3 30 20.6 W	or 52° 35′ 09″ W	
½Z	61° 42′ 05″		cos. 9.67584
Z N	123 24 10 W	or S 56° 35′ 50″ W	

With the same data, but correcting the altitude by the use of Table II, Muir, or Table Aquino, p. 5, we have:

	⊙ 36° 48′ 00″	I. C. + 2′ 00″		⊙ 36° 48.′0	I. C. + 2.′0
Corr. Muir	11 04	+ 9 04	Aquino	10.8	+ 8.8
	⊖ 36 59 04	+ 11 04		⊖ 36 58.8	+ 10.8
L. A. T. = $2^h\ 47^m\ 31^s$			L. A. T. = $2^h\ 47^m\ 33^s$		
Which is the same as in exact solution.			Which differs by 2^s from the exact solution, or 0.′5 of arc.		

Therefore we can see at once that these tables simplify the work and do not affect the accuracy of the result.

With the same data and taking the nearest second of declination, calculating it as follows:

Decl.	2°	34′ 02″.5	H. D.	58.71
		5 52.3		6
d	2	39 55 N		352.26

it is found that

$$\text{L. A. T.} = 2^h\ 47^m\ 30^s$$

This shows a difference of 1^s in time or 15″ in arc.

With the same data, taking *d* to the nearest minute, we find that

$$\text{L. A. T.} = 2^h\ 47^m\ 30^s$$

Now take *h* to the nearest minute, and

$$\text{L. A. T.} = 2^h\ 47^m\ 31^s.5$$

Now take the values of *h* and *d* to the nearest minute. The result is as follows:

$$\text{L. A. T.} = 2^h\ 47^m\ 30^s.5$$
$$Z = \text{S } 56°\ 35'\ 30''\ \text{W.}$$

From this it can be seen that the difference in the local apparent time in this example is but $0^s.5$ of time or 7″.5 in arc.

The books ordinarily supplied to a navigator in our service will not permit of closer work than that given in the first solution. It is evident then that a navigator need but take his G. M. T. to the nearest hour when multiplying the H. D. to get the correction to *d*, and then take *d* to the nearest minute of arc. It is also evident that *h* to the nearest minute of arc is sufficiently accurate.

Having now found that the results from the rigorous and approximate solutions differ so slightly, the method used by Lieu-

tenant Radler de Aquino, of the Brazilian Navy, can be discussed. Briefly stated his method is to find the h and Z of a celestial body at some place within thirty miles of the D. R. position, and the problem is first to find the latitude of this spot, then the longitude, and h and Z any time after the latitude is found. This is explained in the UNITED STATES NAVAL INSTITUTE PROCEEDINGS for December, 1908.

The example used above will now be solved by this method.

W.	$2^h\ 43^m\ 15^s$	⊙ 36° 48.′0	I. C. + 2.′0	Decl. 2° 34.′0	H. D.	58.71
C—W.	3 52 20	10.8	+ 8.8	5.9		6.
C.	6 35 35	⊖ 36 59	+ 10.8	*d* 2 40 N		352
C. E.	+ 12 16					
G. M. T.	6 23 19	Mch. 27		*Eq. t.* 5^m 32.83	H. D.	.767
Eq. t.	5 28			4.6		6.
G. A. T.	6 17 51			5 28		4.6
G. H. A.	94° 27′ 45″					
Long.	52 30 00 W					
t +	41 57 45	*a* = 42° 00′	*b* = 3° 35′	1.36	*t* = 42° 03′	
			90 + *b* = 93 35	26.	G. H. A.	94 28
			∦ *L* 39 35 N	8.2	Long.	52 25 W ∦
comp. ⊖ = 36° 57′		*Z* = S 56° 52′ W	*B* = 54°	27.2		
obs. ⊖ = 36 59				35.4		
2′ S. + W.				.03		
				1.		

The true azimuth rigorously worked out is S. 56° 35′ 50″ W., a difference of 16′ which is 1′ greater than the 15′ error, but well within reasonable limits, as azimuths laid off on charts can have a greater error than that and still give reasonably correct results.

Assuming that the true latitude is 39-38-24 N. the position determined from the rigorous solution will be

Lat. 39-38-24 N. Long. 52-29-30 W.

The position determined from Aquino will be:

Lat. 39-38-24 N. Long. 52-31-00 W.

The results therefore of the Aquino method of finding a line of position are within the limits of error. The endeavor has been made to choose an example that when worked both ways would

have as great a difference as possible, and the writer has no doubt that there are other examples that would give a greater difference, but doubts whether they would ever occur in practice.

The element of time of solution has not been touched upon, nor have chances of error in picking out functions, logs, etc., or the amount of work; however, the following table gives an idea of these:

Method.	Time.	No. of Figures.	Symbols or Signs.	No. of Books.	Opening of Books.	Chances of Error.
Time Sight Formula.....	8	150	28	2	7	23
Altitude Cos Formula.....	9	153	37	2	9	24
Altitude Haver Formula...	7	139	38	2	8	24
Aquino	4	100	25	1	2	13
Common to all.....	5	126	29	2	3	18

These figures may vary slightly in different examples.

The question now arises, is it safe for navigators to use these short methods, which do not give exactly the same results as the rigorous solution. The writer considers that, taking into account every condition that surrounds an observer at sea, a moving platform, uncertainty in the time of the standard meridian, unknown refraction, inaccuracy of the charts on which plotting is done due to shrinkage of paper after printing and small compass roses, a navigator is justified in using the Aquino method, and can say that the position so determined is fully as accurate as the position determined by the rigorous method, and that when time is taken into account the shorter and quicker the method the more valuable it is.

An endeavor has been made in this article to show that, starting from the original formulas as used by earlier navigators which gave accurate mathematical results but inaccurate answers to the question of the ship's position, the tendency has been to recognize this latter fact, and to introduce short cuts, which decrease the amount of work and yet give as accurate answers, and that these changes have been along the lines of, first, rearrangement of formulas; second, construction of tables; third, construction of diagrams; fourth, tables again; and fifth, graphic representation on charts, instead of mathematical work on paper. The method of Aquino shown is in the writer's opinion the best of any that have been published.

The writer considers that this article is for navigators, and not for students learning the rudiments of navigation expecting to advance in knowledge of the subject. The student must be taught to be accurate, and all short methods, unless used carefully and fully understood by those who use them, are liable in time to make the users careless, and cause them to depend upon a rule and not upon their knowledge of the "reason why." It is hoped that other methods may be carefully examined and worked, to see if they are not better than the one finally worked in this article. The main things to be kept in mind are accuracy of tables, compactness and small number of books, and ease of solution.

Let the navigators speak out and tell the service at large their experiences in using the different methods of finding a line of position.

DISCUSSION.

A Study of the Development of the Method of Finding a Line of Position.

LIEUTENANT RADLER DE AQUINO, B. N.—I feel deeply honored by the Board of Control's kind invitation to discuss Commander Marvell's ably presented paper on the development of the method of finding a line of position at sea and I think he has rendered to all readers of the PROCEEDINGS and to all navigators a great service in showing by comparative study the advantages of the use of modern methods of navigation.

While I still believe my "Altitude and Azimuth Tables" to be the "simplest and readiest in solution" I think all those interested in the advancement of the science of navigation will welcome his final suggestion asking navigators to "speak out and tell the service at large their experiences in using the different methods of finding a line of position."

Since the publication of my article in the December, 1908 issue of the PROCEEDINGS, describing my tables, many improvements were introduced and a second edition of them has just been published in London with further simplifications and improvements.

As Commander Marvell is on the Asiatic Station this new edition has not yet reached him and the development he uses on page 218 is still the one to be found in my first edition.

The small differences he found in the azimuth and in the longitude are easily accountable and are not due to the tables themselves.

First, when he states there is a difference of 16′ between the two azimuths, I believe he overlooked the fact that the position used in the example on page 216 is not the same as used on page 218. The azimuth S 56° 35′ 50″ W is from Lat. 39° 45′ 00″ N and Long. 52° 35′ 09″ W, while the azimuth S 56° 52′ W taken from the tables corresponds to Lat. 39° 35′ and Long. 52° 25′ W.

The difference of one minute and a half of longitude, while not important in a latitude as high as 39° 38′, is due to the fact that he has rounded up all the data to the *nearest* minute of arc.

Of course, as I have stated in my tables, if greater accuracy is desired the data must be taken to the *nearest tenth of a minute of arc*, and curiously enough if we take the Greenwich hour angle, the declination, the hour angle, the latitude and the altitude to the nearest tenth of a minute of arc we will find exactly the same longitude as Commander Marvell found by the rigorous solution.

Thus with G. H. A. $= 94° 27'.7$, $d = 2° 40'.3$, $t = 42° 3'.2$, $L = 39° 35'.8$ and $h = 36° 58'.8$ we will find by means of the tables for Lat. $39° 38'.4$, the Long. $52° 29'.5$.

The writer fully agrees with Commander Marvell's statement on page 219 "that a navigator is justified in using, and can say that the position determined by the method shown above, is fully as accurate as the position determined by the rigorous method, and when time is taken into account the shorter and quicker the method the more valuable it is."

A slightly improved method of finding the altitude and azimuth by means of my tables has been developed recently whereby it is not necessary to *interpolate* and find the true values of b and t for the true value of declination d, as explained on pages xv, xxi, and xxv of my tables. It is sufficient to find only in column a the values of b (generally a whole degree) and of t that correspond to an approximate value of d. This approximate value of d is *always* the tabular value nearest to the true value. b is combined in the usual way with L_A. (also generally the whole degree nearest the dead reckoning latitude) to find C, and h' and Z' are found corresponding to the a and C. Now as h' and Z' are for the tabular value of d, we must correct them for the difference Δd between this tabular value and the true value of the declination.[1] We know from page xvii that a change of altitude Δh for a given change of declination Δd is given by the formula: $\Delta h = \Delta d \cos M$, where M is the parallactic angle. If we call, in Fig. 2 on page xii, the angle mMP: α and the angle mMZ: β, we have $M = \alpha + \beta$.

The value of α is found on the same line with b, d, and t (α being practically the same for all three values of a). In the same way β is found on the same line opposite C, h, and Z.

However, instead of finding C with L_A. and b, it is better to find L_A. from b and C, as explained below.

The working out of Commander Marvell's example will show the great advantage of this improvement.

Pages 110 and 111. 2d ed., 1912.

$a = 42° \ 0'$ G. A. T. $= 6^h \ 17^m \ 51^s = 94° \ 27.'7$

$b = 4°$ ..... $d' = 2° \ 58'$ ... $t_A = 42 \ 4$ W. ..... $\alpha = 87.°3$

$d = 2 \ 40.3$ N $G_A = 52° \ 23.'7$W

$\Delta d = - \ 17.7'$

$C = 36°$ ..... $h' = 36° \ 57'$ ... $Z' =$ S $56° \ 52'$W. ..... $\beta = 47.°1$

$L_A = 40°$ N $\Delta h = - \ 13.5$ $M = 40.°2$

$h_A = 36° \ 43.'5$

$h = 36 \ 58.8$

$h - h_A = + \ 15.'3$

NOTE.—Numbers taken out of the tables by inspection are black-faced in order to distinguish them from data given or found.

In addition to the formulæ given on page xxviii for finding L_A. with b and C, we have added those for finding M with α and β.

d and L_A. same name $\begin{cases} t < 90° \begin{cases} L_A < b : L_A = b - C \text{ and } M = \alpha + \beta \\ L_A > b : L_A = b + C \text{ and } M = \alpha - \beta \end{cases} \\ t > 90° \ldots\ldots : L_A = C + b \text{ and } M = \beta - \alpha \end{cases}$

d and L_A. contrary names ..... : $L_A = C - b$ and $M = \alpha + \beta$

When $t > 90°$ the sum $C + b > 90°$ also, and we must subtract it from 180° to obtain L_A.

[1] As Δd is generally only a few minutes of arc, Z' does not need in practice any correction. The formula on page xvii: $\Delta Z = \sin M \sec h \cdot \Delta d$ shows us that ΔZ is *always* smaller than $\sec h \cdot \Delta d$. Under $h = 60°$, ΔZ is always smaller than $2\Delta d$.

A simple inspection of these formulæ shows that no difficult rules are necessary with this new process. A knowledge of the approximate value of L_A is *always* known by dead-reckoning, and, therefore, we can immediately find, in view of the fact that b and L_A are generally whole degrees, the value of C that combined with b will give us L_A. The tabular value h' nearest to the true altitude h shows us opposite it also the value of C.

The formulæ show also that when we *subtract* b and C to find L_A we must *add* α and β together to obtain M. When we *add* b and C to find L_A we must *subtract* α and β from one another to obtain M.

The "altitude correction" $\Delta h = 13'.5$ is given immediately by our altitude correction table,[2] where we enter at the top with $\Delta d = 17'.7$, and with $M = 40°.2$ on the left hand side. If M is greater than 90°, enter the table on the right hand side. The correction has the same sign as $d - d'$ or Δd when M is smaller than 90° and the contrary sign to $d - d'$ or Δd when greater than 90°.

In this way altitude and azimuth are found by means of simple mnemonical rules *without* interpolating.

Assuming now, as Commander Marvell did, that the true latitude is 39° 38'.4 we would find the true Long. 52° 29'.5 W which is exactly the same found by the rigorous solution. These exact results are obtained in spite of the fact that the *exact* values of d', t_A., and h' are respectively 2° 58'.3, 42° 04'.2 and 36° 57'.4, whereas the tables only give them to the nearest minute of arc.

If we had tabulated and used these *exact* values of d', t_A. and h' we would find Long. 52° 29'.1 W instead of 52° 29'.5, a difference of *four-tenths* of a minute of arc from the rigorous solution. This shows it is doubtful whether it would be wise to give data in the Tables to the *nearest tenth* of a minute of arc.

COMMANDER G. W. LOGAN, U. S. Navy.—Apropos of the contention that, by reason of the unavoidable existence of certain errors which prevent absolute accuracy in the determination of position at sea, it is admissible to open the door to further errors by resorting to approximate solutions, it will be appropriate to quote the following from Chapter XVI of Bowditch's "American Practical Navigator" (revision of 1902-3):

"It is a well-recognized fact that exact results are not attainable in navigation at sea; the chronometer error, sextant error, error of refraction, and error of observation are all uncertain; it is impossible to make absolutely correct allowance for them, and the uncertainty increases if the position is obtained by two observations taken at different times, in which case an exactly correct allowance for the intervening run of the ship is an essential to the correctness of the determination. No navigator should ever assume that his position is not liable to be in error to some extent, the precise amount depending upon various factors, such as the age of the chronometer rate, the quality of the various instruments, the reliability of the observer, and the conditions at the time the sight was taken; perhaps a fair allowance for this possible error, under favorable circumstances, will be 2 miles; therefore, instead of plotting a position upon the chart, and proceeding with absolute confidence in the belief that the ship's position is on the

[2] Also by our Plane Traverse Tables in LAT. column if we enter them with Δd as D and with M or $180° - M$ as Course.

exact point, one may describe, around the point as a center, a circle whose radius is 2 miles—if we accept that as the value of the possible error—and shape the future courses with the knowledge that the ship's position may be anywhere within the circle.

"It is on account of this recognized inexactness of the determination of position that some navigators assume that the odd seconds may be neglected in dealing with the different terms of a sight; the average possible error due to this course is probably about one minute, though under certain conditions it may be considerably more. It is possible that, in a particular case, the error thus introduced through one term would be offset by that from others, and the result would be the same as if the seconds had been taken into account; but that does not affect the general fact that the neglect of seconds as a regular thing renders any determination liable to be in error about one minute. Those that omit the seconds argue, however, that since, in the nature of things, any sight may be in error two minutes, it is immaterial if we introduce an additional possibility of error of one minute, because the new error is as liable to decrease the old one as to increase it; but the fallacy of the argument will be apparent when we return to the circle drawn around our plotted point. The eccentricity of the sextant may exactly offset the improper allowance for refraction, and the mistake in the chronometer error may offset the observer's personal error, but unless we know that such is the case—which we never can—we have no justification for doing otherwise than assume that the ship may be any place within the 2-mile circle. If, now, we increase the possible error by 1 mile, our radius of uncertainty must be increased to 3 miles, and the diameter of the circle, representing the range of uncertainty in any given direction, is thereby increased from 4 to 6 miles. . . . .

"There is a more exact way of defining the area of the ship's possible position than that of describing a circle around the most probable point, as mentioned in the preceding article, and that is to draw a line on each side of each of the Sumner lines by which the position is defined, and at a uniform distance therefrom equal to the possible error that the navigator believes it most reasonable to assume under existing conditions; the parallelogram formed by these four auxiliary lines marks the limit to be assigned for the ship's position; this method takes account of the errors due to poor intersections, and warns the navigator of the direction in which his position is least clearly fixed and in which he must therefore make extra allowance for the uncertainty of his determination."

It is not maintained that, by adhering to exact methods of computation, an absolutely certain position results; but it is maintained that the position thus determined is the most probable one and is surrounded by a minimum of doubtful area.

The degree of exactness with which the work is to be carried out may depend upon attendant conditions. At sea, making a long passage, the daily position serves only to show that the ship is making good her course and to afford a departure for the next day's reckoning; in this case a radius of uncertainty of two or three miles is negligible. When, however, the position is to be used for a landfall or for governing the movements of a

vessel in scouting work or in deep-sea sounding, greater accuracy should be sought.

It would be a happy compromise on this question if the navigator were supplied with tables of trigonometric functions which gave values of logarithmic and natural sines, cosines, etc., for every quarter minute of arc (15″). With such tables, by assuming values of angles to the nearest of the quarter-minute divisions and omitting interpolation, an error of not more than 7″ would be involved in any term of the computation; this would save the time as well as the chance of error incident to interpolation and the results would be sufficiently exact for all ordinary purposes of navigation. Such tables are already in existence, and it is hoped that they will shortly be made available to our navigators by being incorporated in a publication of the Hydrographic Office.

In enumerating the various formulas available for the computation of altitude, Commander Marvell has omitted the following, which possesses many advantages:

$$\sin h = \sin L \sin d + \cos L \cos d \cos t.$$

To show the simplicity of computation by this formula, an example follows, wherein the data are the same as those in the example worked by Commander Marvell as an illustration of the Aquino method:

L	39° 35′	sin	9.80428	cos 9.88688
d	+2 40 18	sin (+)	8.66850	cos 9.99953
t	42 03			cos 9.87073
A	+.02970	log (+)	8.47278	
B	+.57166			log 9.75714
h	N. sin .60136			
	Ang. 36° 58′ 03″			

It will be seen that this formula is well adapted for expeditious and accurate computation; the form is simple and chances of error are slight.

In this example, taking the features tabulated by Commander Marvell in his comparison of other methods, we have for the computation of the altitude by this "sine formula": time, 4½ minutes; number of figures, 76; number of symbols or signs, 20; number of books, 1; number of openings, 6; chances of error, 11. This will be seen to compare most favorably with the other methods, even those in which the results rendered can be less depended upon for accuracy. To make the comparison complete, it is fair to take into consideration the determination of the azimuth, for which, if the diagram is used, one may add about half a minute of time, five figures, and four chances of error.

The selection of the method of solution will always be a matter of personal preference with the individual navigator, and will depend frequently upon what he has "been brought up on" and finds himself most accustomed to. If the new navigation is preferred to the old, an almost equal choice of solutions lies between the Aquino method, the haversine formula, and the sine formula to which reference has just been made. The

last-named, for some reason, is not frequently found in works on navigation, and it is for the purpose of bringing attention to it as at least one of the best methods that this comment is submitted.

LIEUT.-COMMANDER W. S. TURPIN, U. S. Navy.—I have read with great interest Commander Marvell's paper, "A Study of the Development of the Method of Finding a Line of Position."

The conclusions derived by the author agree with those that I have arrived at after duty for something over a year as navigator of the *Delaware*.

When I was first ordered to the ship I began to brush up my navigation and investigated the various methods that had come into use in the last few years. At that time I was not acquainted with Aquino's tables and I decided to use a rigorous method that had been described in the Naval Institute about two years ago, in which the haversine was used to the exclusion of all other functions. This was facilitated by having on board Inman's Tables of Haversines and shortly after joining, receiving the 1911 edition of Bowditch's Useful Tables in which this haversine table had been incorporated.

In a conversation with the author, mention was made of the rapidity with which sights could be worked out by using Aquino's tables, and I was so impressed by the advantages of their use which the author had pointed out to me that I at once began to investigate their merits. By working out several sights in the usual way and also by the tables I soon became convinced that the tables were accurate, as my results agreed, and the time required to work sights with the tables was very much shorter and the chances of error were, in my opinion, much less.

To show the rapidity with which sights can be taken and the line of position determined and plotted it is only necessary to cite the case where four sights of stars were taken and the lines plotted within half an hour. This included the determination of two of the stars' names, about which I was uncertain. On an average you should be able to take a sight and work it out in from five to seven minutes.

I am firmly convinced that any navigator who once uses these tables will not use anything else in the present state of the development of the art of navigation. They are all the author claims for them, easy of application, rapid, and above all accurate.

LIEUT.-COMMANDER W. R. GHERARDI, U. S. Navy.—Those navigators with whom I am acquainted and who have used Radler de Aquino's method are greatly in favor of it and work all their lines of position by the use of his tables.

I am of the opinion that its simplicity will appeal not only to the naval navigator but particularly to merchant officers. Having been an instructor of navigation in a nautical school ship, I am somewhat acquainted with the slim educational foundation upon which the merchant officer frequently must base his navigational structure.

There is in course of preparation at the Naval Observatory a book to assist the navigator in finding his position at sea. It is hoped to acquire the rights to publish Radler de Aquino's tables and to give simple forms, some of which are now being tried out by our cruising ships.

It is believed that the part of practical navigation connected with finding the ship's position at sea will be greatly simplified, that almost all the methods, except for meridian sights, now in Bowditch will eventually be dropped for the simpler methods, that the number of tables to be used with this book will be greatly reduced, and that the azimuth tables and the star identification tables will no longer be required.

LIEUT.-COMMANDER H. G. SPARROW, U. S. Navy.—I have no new suggestion to make relative to the methods of finding lines of position set forth in Commander Marvell's paper, further than to say that I confine myself to two types of sights, the Marcq St. Hilaire and the ex-meridian. By so doing, greater familiarity is gained with the formulæ, and the names of the different elements used need not be written down. I use seconds of arc and half seconds of time, in the data used, on the principle that in some cases all errors may be cumulative and would throw the result out more than the 1′ tolerance.

A few expedients to reduce the mechanical work of solving sights may be of interest. In comparing watch with chronometer, I compare the watch, which is set to 75th meridian time (this being ship time always on this station), with 75th meridian time. The watches furnished navigators can be regulated to within 4s per day. The error of the watch is always kept less than 30s, and comparisons are made at daylight, 11.00 a. m., and sunset. The watch correction is easily remembered, and is applied mentally to the time of sight when entering same in the work book. This (with the addition of 5 hrs.) gives G. M. T. at once.

A table of combined altitude corrections for sun and stars, for each deck and bridge, is posted in front of the chart board. This is copied directly from Table 46 of Bowditch's Useful Tables. By inspection the observed altitude is corrected and entered at once in the work book. This gives G. M. T., and true *h* without a single extra figure being written.

At daylight each day a blank form giving all the needed arguments for sun sights, also R. A. M. S., is filled out and slipped in a holder in front of chart board. This makes reference to the N. A. for sun sights unnecessary. This form is printed aboard ship and is here shown:

Date.....191..

G. M. NOON

Dec. ° ′ ″	H. D.	Eq. Time to M. T. m s	H. D.	R. A. M. S. h m s

G. A. NOON

Dec. ° ′ ″	H. D.	Eq. Time to A. T. m s	H. D.	S. S. D.

The S. S. D. is unnecessary and is never filled in.

LIEUT.-COMMANDER E. B. FENNER, U. S. Navy.—In response to the Institute's request for comment on the various methods of finding a line of position discussed in Commander Marvell's article, I would like to submit the following points for consideration:

1. As to the accuracy of the Aquino method: On page 215, the assumption is made that we have an observation error of ± 47″ to start with and hence we might as well have an additional tabular error of ± 1′ giving in some cases a total error of ± 1′ 47″. The observation error is unavoidable, but I do not consider that a valid reason for adding to it an avoidable error of one mile.

A second and more serious objection to the Aquino method lies in the plotting error. With the ordinary altitude formulæ we use an assumed position as close to the true position of the ship as possible, very seldom in error as much as 10 miles. With the Aquino method we have to use whatever assumed position the problem gives us, often as much as 40 miles from the ship's true position.

Every mechanical difficulty of plotting, as inaccurate charts, shrinkage, small rose, slipping parallel rulers and dividers will produce its error in either case; but in the average Aquino sight this error will be about four times as great, due to the greater distances to be plotted. Also a separate assumed position must be plotted for every Aquino sight, thus introducing still further chance of plotting error.

I believe another ± 1′ would be a very moderate allowance for excess of plotting error in the Aquino method over the ordinary altitude formulæ, although it would be difficult to prove the truth of this belief.

2. As to speed: The actual working out of the Aquino sight is rather more rapid than any other I have tried, but I cannot find the difference shown in the table on page 219, if all classes of sights are worked out to the same degree of accuracy and for the same kind of results.

For example take the time sight on page 216, and work for a line of position by the tangent method, using azimuth tables for Z and dropping seconds of arc. The work in obtaining G. A. T., $\odot$, Dec., and *Eq. t* is exactly the same for both sights, for there is no reason why we should correct altitude differently in the two cases. In the remainder of the work there are about 87 figures in the time sight and about 73 in the Aquino, for one can easily pick an azimuth from the tables with an error of less than 2° without the help of figures and an error of 2° in Z when the assumed and true positions are ten miles apart, would give an error of about ± 20″ in position.

The difference in number of symbols is of no importance to navigators who use printed forms, as most of them do.

Again, however, the greatest objection to the Aquino sight on the ground of speed lies in the plotting. If we take a cross of three stars and work them all out by the ordinary altitude formulæ, we plot altitude differences and bearings from one fixed point which we assumed at the beginning. If we work these same sights by the Aquino method we must plot, in addition to the original D. R. or assumed position, a different assumed position for every one of the three sights, thereby losing most or all of the time gained in computation.

One other minor objection to the Aquino sight is the double entry tables in which we have to find an approximate co-incidence of two arguments, always a longer process than the use of a single entry table.

LIEUT.-COMMANDER C. C. BLOCH, U. S. Navy.—The "Newest" Navigation Altitude and Azimuth Tables by Lieutenant Aquino, of the Brazilian Navy, is all that the author claims for it—"The Simplest and Readiest in Solution."

I have been using the Aquino tables for some time, and I have found them sufficiently accurate for all practical purposes, and preferable to all rigorous methods for the following reasons:

1. The chances of error are very small.
2. The facility of solution.
3. The easiness with which error may be detected.

I have worked numbers of sights using the Aquino tables, and checked the solution by the haversine formula; in no case has there been a difference in result greater than 1.3′. In most cases the results have been identical.

In Lieutenant Aquino's latest book[3] he includes a "Ready Reckoner" which does away with the necessity of the two multiplications which Commander Marvell speaks of. However, this introduces a book opening, and I prefer making the two multiplications, usually mental, to making one book opening.

Recently, Lieutenant Aquino has devised a method whereby interpolation for the values of b and T ass. is no longer necessary. This brings into use the little used position angle M. While this method does away with interpolation, it necessitates picking out certain auxiliary angles α and β and the memory of certain precepts, all of which I consider more laborious than a simple interpolation.

Using the interpolations, I find it possible to work lines of position in about five minutes from the time of taking the sight.

Below is a form suggested for Aquino's method; it is thought that such forms could be issued to ships for use, binding them in a loose leaf binder. A third column and back would be ruled for use in case of azimuths, meridian and ex-meridian altitudes and for the navigator's remarks, soundings, bearings, etc.

In case the navigator prefers a method of computation to the tables, I would suggest the use of Aquino's "New Altitude Tables," where the formulæ given below are used for the solution of the spherical triangle; solving for h only:

(1) $\log \operatorname{cosec} \frac{\theta}{2} = \frac{1}{2} \log \sec L + \frac{1}{2} \log \sec d + \log \operatorname{cosec} \frac{t}{2}$.

(2) $\operatorname{versin} (90° - h) = \operatorname{versin} (L - d) + \operatorname{versin} \theta$.

[Aquino's new tables have all logs multiplied by 10^6 so that no decimals appear. The tables can be used for these formulæ only.]

I find these formulæ, using Aquino's tables, most simple and convenient.

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[3] The "Newest" Navigation Altitude and Azimuth Tables, by Lieutenant Radler de Aquino, Brazilian Navy, second edition, enlarged and improved, London, 1912. Published by J. D. Potter, 145 Minories, London, E. Price, 10s. 6d. net.

I particularly like them on account of the absence of characteristics and decimal points.

The derivation of these formulæ is explained in Aquino's "New Altitude Tables," page ii *.

I.

	Dec. 30, 1912.	P. M. ⊙ sun sight.		
1	Lat.D.R.	28° 50′ 00″ N		
2	Long.D.R.	78° 41′ 00″ W		
3	Dec.	23° 10′ 58.5″	H.D.	9.73″
4	Cor.	(—) 1′ 28″	G.M.T.	9 h
5	Dec.	23° 09′ 30″	Corr.	1′ 28″
6	E.T.	2′ 35.9″	H.D	1.21″
7	Corr.	(+) 10.9″	G.M.T.	9 h
8	E.T.	2m 46.8s	Corr.	10.9″
9	R.A.			
10	Corr.			
11	R.A.			
12	W.T.	4h 00m 30.5s		
13	C.-W.	4h 58m 00s		
14	C. T.	8h 58m 30.5s		
15	C.C.	(+)1m 58.5s		
16	G.M.T.	9h 00m 29s		
17	E.T.	— 2m 46.8s		
18	Table III.			
19	G.S.T.			
20	R.A.			
21	G.H.A.	8h 57m 42s		
22	arc.	134° 25′ 30″	arc.	134° 25′ 30″
23	λ.D.R.	78° 41′ 00″	T ass.	55° 48′ 00″
24	T.D.R.	55° 44′ 30″	λ ass.	78° 37′ 30″
25	a.	49° 30′ 00″	L ass.	28° 43′ 00″
26	b.	37° 17′ 00″	h.	15° 16′ 30″
27	c.	66°	Corr.	+ 6′ 24″
28	z.	232° 00′ 00″	h.	15° 22.9′
29	h′.	15° 19′ 00″		
30	h′-h.	3.9 Toward		

II.

	Dec. 30, 1912.	P. M. ♀ Venus sight.		
	Lat. D.R.	29° 07′ 00″ N		
	Long.D.R.	78° 32′ 00″W.		
	Dec.	16° 14′ 24″ S	H.D.	16.6″
	Cor.	(—)10′ 41″	G.M.T.	10.4h
	Dec.	16° 03′ 43″	Corr.	10′ 41″
	E.T.			
	Cor.			
	E.T.			
	R.A.	21h 35m 46s	H.D.	11.5s
	Corr.	2m 00s	G.M.T.	10.4h
	R.A.	21h 37m 46s	Corr.	119.6s
	W.T.	5h 23m 47s		
	C.-W.	4h 58m 40.5s		
	C.T.	10h 22m 27.5s		
	C.C.	(+) 1m 58.5s		
	G.M.T.	10h 24m 26s		
	R.A.M. ⊙	18h 34m 14s		
	Table III.	(+) 1m 42.5s		
	G.S.T.	20h 00m 22.5s		
	R.A.	21h 37m 46s		
	G.H.A.	7h 22m 36.5s		
	arc.	110° 39′ 00″	arc.	110° 39′ 00″
	λ.D.R.	78° 32′ 00″	T ass.	31° 53′ 00″
	T.D.R.	32° 07′ 00″	λ ass.	78° 46′ 00″
	a.	30° 30′ 00″	L ass.	29° 15′ 00″
	b.	18° 45′ 00″	h.	35° 30′ 30″
	c.	48°	corr.	— 8′ 30″
	z.	218° 24′ 00″	h.	35° 22′ 00″
	h′.	35° 12′ 00″		
	h′-h.	10 Toward		

LIEUT.-COMMANDER W. K. RIDDLE, U. S. Navy.—Commander Marvell's article brings out clearly the contrast between the "time honored" methods of finding a ship's position at sea, and the improved facilities for solving the problem with modern tables and appliances. This is a matter of deep interest to all of us, and it is a pleasure to read a discussion of this important subject by one who knows the "ways and means" so thoroughly.

It may be safely said that every navigator is in favor of methods which economize time, provided that these "short cuts" involve no loss of accuracy. The assumption of a possible error of ± 47″ in an observed altitude, combining as it does, personal error, error in refraction, and instrumental error due to graduation of arc, is surely a modest estimate: even an assumption of ± 1′ error would be within reasonably small limits.

While the Atlantic Fleet is of course underway a good part of the time, most of the cruising is in piloting waters, so there has, of late, been comparatively little deep sea navigation (averaging, I should say, less than one day per month). Having made, however, during the past summer for purposes of comparison, a large number of simultaneous observations, on the bridge, the writer reached the conclusion that two careful observers will seldom differ more than one minute of arc, in their measured altitudes, when the horizon is clear. When conditions are less favorable, it is quite possible for them to differ a minute and a half, or even two minutes, with the ship perfectly steady, but the horizon, just a trifle indistinct. With a

poor horizon, there is a large element of uncertainty as to exact contact, and the difference, of course, becomes much greater.

One of the sources of inaccuracy mentioned by Commander Marvell, "small compass roses," is completely eliminated by the use of the Court celluloid three-arm protractor (ruling the meridians on it, as suggested by Lieutenant R. A. Koch), thus supplying a compass rose eleven and one-half inches in diameter, for use with all charts— an idea which, incidentally, has proved of immense value for rapid plotting in piloting waters, especially in swift currents, and in localities where it is necessary to round a light at a specified distance.

Since reading some time ago a paper by Commander G. W. Logan, published in the NAVAL INSTITUTE PROCEEDINGS for December, 1908, the writer has used Captain Weir's azimuth diagram almost exclusively, in all azimuth work, and found it more convenient than the azimuth tables, and much quicker: it is also well within the limits of accuracy (15′ of arc) attainable with the navigational instruments in present use.

I have studied the paper by Lieutenant Radler de Aquino of the Brazilian Navy, in which he gives an excellent description of the "Simplest and Readiest Solution," but have had no practical experience with this method aboard ship: it is plain, however, that his "Altitude and Azimuth Tables" do facilitate the determination of the ship's position, and mean a curtailment in the time and amount of work involved, so this method is, unquestionably, a step in advance. If the department should see fit to issue these tables to the service, I feel convinced that they would very soon be in general use.

Meanwhile, however, the haversine method for the Marcq St. Hilaire sight, is widely known among the navigators of the fleet and most of them seem to regard it as a great improvement upon the old cosine formula; the new tables are conveniently arranged, reducing the amount of mechanical work to a minimum, and the functions change so gradually that the interpolations are quickly and easily made. As a further saving of time, forms for this work (sun sight, star sight, azimuth, etc.), are printed aboard ship, and kept ready for use—to be afterwards pasted in the Navigators' Work Book. Table 46, Useful Tables, Bowditch, 1912, combining the corrections to the observed altitude (dip, refraction, parallax, and mean semi-diameter), eliminates one "opening of books" and is, in itself, a good "time saver"—we no longer need refer to Muir, Table II. To use the nearest hour of G. M. T. in multiplying the H. D. to get the correction to declination, and then to use both d and h to the nearest minute of arc, as suggested, is an additional useful "short cut"; it falls well within the limits of accuracy possible to the observer, and so cannot affect the correctness of the result.

For purposes of comparison the problem worked out by the time sight formula, and again by the Aquino method in Commander Marvell's interesting paper, has been worked out by the haversine formula for St. Hilaire sight below. In the first solution the "short cuts" mentioned above, are used; the second, is the rigorous solution:

MARCQ ST. HILAIRE

(1)

Date: March 27 Sun: p.m. Assumed Lat.: 39° 45′ N Long.: 52° 30′ W

W.	2h 43m 15s	alt.	36° 48′ 00″			dec. 2° 34′ 02.5″	Eq. T. 5m 32.3s
C.-W.	3h 53m 28s	corr.	11′ 06″			corr. 5′ 52″	corr. 4.6
C.	6h 36m 43s	h′.	36° 59′ 06″			dec. 2° 40′ —	Eq. T. 5m 27.7s
C.C.	12m 16s*f*			I.C.	+ 2′ 00″	58.71	
G.M.T.	6h 24m 27s			Cor. Ta. 46	+ 9′ 06″	6	.767
Eq. T.	5m 28s			corr.	+ 11′06″	352.26	4.602
G.A.T.	6h 18m 59s						
Long.	3° 30′ 00″	=	52° 30′W				
L.A.T.	2h 48m 59s	log hav.	9.11358				
Lat.	39° 45′	log cos.	9.88584				
dec.	2° 40′	log cos.	9.99953				
		log hav.	8.99895	Nat. hav.	09976		
L-d.	37° 05′			Nat. hav.	10112		
90-h	53° 15′			Nat. hav.	20088		
h′	36° 45′						
	14′	, or 14 miles nearer sun on line 236½					

RIGOROUS METHOD

(2)

Date: March 27 Sun: p.m. Assumed Lat.: 39° 45′ N Long.: 52° 30′ W

W.	2h 43m 15s	alt.	36° 48′ 00″			dec. 2° 34′ 02.5″	Eq. T. 5h 32m 31
C.-W.	3h 53m 28s	corr.	+ 11′ 04″			corr. 6′ 15″	corr. 4m 58
C.	6h 36m 43s	h′.	36° 59′ 04″			dec. 2° 40′ 17.5″	Eq. T. 5h 27m 43
C.C.	12m 16s*f*			I.C.	+ 2′ 00″	Ta. 14	
G.M.T.	6h 24m 27s			D.	− 5′ 48″	Ta. 16	
Eq. T.	5m 27.4s			P.	+ 0′ 07″	Ta. 20	
G.A.T.	6h 18m 59.6s			R.	− 1′ 18″		
Long.	3° 30′ 00″ W			S.D.	+16′ 03″	58.71	.767
L.A.T.	2h 48m 59.6s	log hav.	9.11358		+11′ 04″	58.57	6.39
Lat.	39° 45′ 00″	log cos.	9.88584			.14	4.602
dec.	2° 40′ 17.5″	log cos.	9.99953			.023	.230
		log hav.	8.99895			.006	.069
						58.68	4.901
						6.39	
						352.08	
L-d.	37° 04′ 42.5″			Nat. hav.	09976	17.604	
90-h	53° 15′ 10″			Nat. hav.	10110	5.281	
h′	36° 34′ 50″			Nat. hav.	20086	374.97	
	14′ 14″, or 14¼ miles nearer sun on line 236° 36′.						

Upon comparing the solutions, one is surprised to see how little they differ in the actual results obtained. The first column of logs in the rigorous solution is identical with the first column in the "short cut" solution, and the second columns differ by two units in the last place (owing to the fact that the nearest minute of declination is used). A saving of 68 figures is effected by the "short cut" solution (which is certainly worth while), and the ultimate results differ less than a quarter of a mile.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE GEOMETRY OF THE MARCQ POSITION-LINES.

By H. B. Goodwin.

If there is any disadvantage in the employment of the process for fixing position-lines by calculated altitudes, as compared with older methods, it is perhaps to be found in the circumstance that the final portion of the work is generally simpler when actual latitudes and longitudes are computed, than when position is obtained by means of the "intercepts" which represent the difference between observed and calculated altitudes, as in the system identified with the name of the late Admiral St. Hilaire, of the French Navy. If the lines of position are actually laid off upon the chart, there is indeed but little difference in the trouble involved, but simple as these graphic methods are to describe, navigators in general are none too fond of putting them into actual practice at sea. The late Captain Lecky, in his well-known "Wrinkles," went so far as to condemn the so-called "new navigation" altogether, upon this very diagram question, for on page 391 of the ninth edition we read, in connection with the work of Brent and others, alluded to later:

> Their book also includes an explanation of that phase of the Sumner or double-altitude problem now known as the "new navigation." This the reader can take or leave, as he pleases. Whilst admitting its neatness, the writer is averse to the diagram part of the method, which somehow seems to him out of place in a ship, except perhaps in fine weather, with the advantage of a commodious chart-room, and this latter is unfortunately not always to be had in the merchant service. Like "lunars," the "new navigation" is of the fancy type—all very well with gentle zephyrs, but out of place in oil-skin weather.

Other officers, without going so far as to condemn graphic processes altogether, are strongly averse to defacing their charts by an unnecessary net-work of lines. Thus Lord Ellenborough, who, as a retired commander of the Royal Navy, is entitled to speak with some authority, wrote in the *Nautical Magazine* of August, 1901:

The principle to which I wish to draw attention is a very simple one. *It is to spare the chart at the expense of the work-book.* In the problems I have referred to, and doubtless in many others, it will often be found preferable to expand or contract the perpendiculars by means of the traverse tables, as the case may require, and to draw diagrams in the work-book upon what is practically a plane chart scale, than to be perpetually covering the chart in use with superimposed sketches.

If, when juniors are employed in assisting a senior, they are allowed to draw diagrams upon the chart itself, the latter must soon become a hopeless maze of lines.

At present there seems to be no settled agreement, amongst those who have written upon the subject, as to the best method of making use of the intercepts to fix the actual position. Messrs. Brent, Walter and Williams,[1] to whom is due the credit of first introducing the method into England, favored the employment of protraction, with the assistance of squared sectional paper. Mr. J. R. Walker[2] protracts to scale on plane paper, adding an analytical solution by means of right-angled triangles, of a somewhat artificial character, which, as he very candidly admits in his preface, is not likely to find much favor with the "practical man." Again, in a work published some years later, Lieutenant Simpson-Baikie[3] throws over the graphic methods altogether, making use of certain special tables, based upon the formulæ for errors in latitude and longitude due to a small change of altitude, with which we were not wholly unfamiliar even in the pre-Sumner days.

It is, then, a leading feature of Mr. Simpson-Baikie's procedure that it dispenses with the necessity for a diagram. In place of it, however, we have to discriminate between a great variety of cases, some twelve in all, depending upon the respective quadrants which contain the bodies observed, the relative magnitude of the azimuths, etc., which is distinctly puzzling. The author indeed seems in the end to entertain some uncertainty as to the adequacy of his own precepts, for he writes: "If still in doubt about the reasons for these corrections, *draw the figure*," so that he is apparently driven back by the force of circumstances upon the very diagram which he was at first disposed to repudiate.

[1] Ex-Meridian Tables and the New Navigation. London, George Philip and Son. 1886.

[2] The New Navigation. Portsmouth, Griffin and Co. 1901.

[3] Tables for Working Combined Altitudes by Saint-Hilaire's Method. London, Imray Lawrie and Co. 1907.

One other work, by Lieutenant Cross, R. N. R.,[1] ought not to be left out of account. It was published towards the end of 1911, and though in size not much more than a pamphlet, gives quite one of the clearest and best accounts of the subject that have as yet appeared. Like Mr. Walker, the author concludes the work by protraction to scale, six miles to one-eighth of an inch being the ratio employed.

Possibly the combination of a rough diagram with some simple form of table might supply a not unsatisfactory solution, and it has occurred to the writer that it might be based upon what is undoubtedly one of the simplest problems of practical navigation, "Having given the course and distance from a point given in posi-

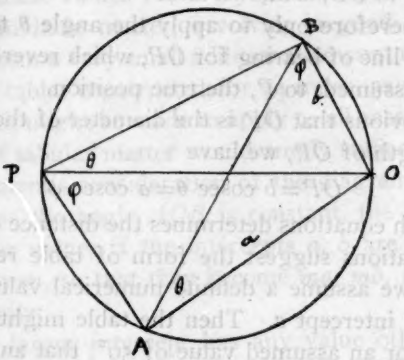


FIG. 1.

tion, to find latitude and longitude intercepts," a short process effected in a few moments by means of the traverse table. The given point of departure is of course the assumed position for which altitudes are calculated, the latitude and longitude deduced being those of the true place of ship.

Let us suppose that O is the D. R. position, and that by means of calculated zenith distances a, and b have been found as intercepts, which represent the differences between the calculated zenith distances and the observed ones for the bodies employed.

Then if perpendiculars are drawn through A, B, the extremities of the intercepts, the intersection of these lines in P gives the true

[1] "The "New Navigation" Presented in a Familiar Way for Captains and Officers of the Merchant Service. Glasgow, James Brown and Son. 1911.

place of ship. Now, since the angles OAP, OBP are by construction right angles, it is obvious that a circle may be described about the quadrilateral figure $OAPB$. Also the angles OAB, OPB in the same segment will be equal to each other, as also the angles OPA, OBA.

If, therefore, the triangle OAB is solved for the values a, b of the intercepts, and an assumed value for AOB, the angle included between the intercepts, we at the same time obtain values of ABO, or ϕ, and OPB, or θ.

Let us assume that the angle BPO, or θ, is known. Then, since the direction of OB, the intercept, is known (running directly towards or away from the body observed), the direction of BP, at right angles to OB, is known also.

We have therefore only to apply the angle θ to this direction, and we have a line of bearing for OP, which reversed is the course from O, the assumed, to P, the true position.

Also it is obvious that OP is the diameter of the circle.

For the length of OP, we have

$$OP = b \operatorname{cosec} \theta = a \operatorname{cosec} \phi,$$

either of which equations determines the distance OP.

These operations suggest the form of table required. Let us suppose that we assume a definite numerical value, say 24 miles, for the larger intercept a. Then the table might be arranged as follows, say for an assumed value of 50°, that angle representing the inclination of the two intercepts to one another:

Larger intercept 24			Larger intercept 24		
Angle included between intercepts 50°			Angle included between intercepts 50°		
Smaller intercept	Angle θ	OP	Smaller intercept	Angle θ	OP
24	65°	26.′5	12	29.°6	24.′4
23	62.4	26	11	26.5	24.7
22	59.7	25.5	10	23.6	25
21	56.9	25	9	20.7	25.4
20	54	24.7	8	18	25.9
19	51	24.4	7	15.4	26.4
18	48	24.2	6	12.9	27
17	44.9	24.1	5	10.5	27.6
16	41.8	24	4	8.1	28.2
15	38.7	24	3	5.9	29.1
14	35.6	24.1	2	3.9	29.6
13	32.5	24.2	1	1.9	30.5

Let us suppose that the two intercepts were 24 and 10. The value of θ would be found to be 23° 36′. Applying this angle to the known bearing of the line of position for the intercept 10, we obtain the line of bearing of OP, that is, the course.

Thus, suppose in the diagram that OB runs N. 29° W. Then BP, at right angles to this line, is S. 61° W., so that PB runs N. 61° E.

Adding 23°.5, the value of θ, to this value, we obtain N. 84°.5 E. for the course from P to O. And OP, from the table, is 25 miles.

Thus, the course and distance from O to P equal S. 84°.5 W., 25 miles. Taking 24 as the limit for the larger intercept, and working for each 2° of angle, say from 26° to 154°, we would find the tabulation of these values for every possible pair of intercepts a somewhat formidable matter, involving a good many thousand entries. But with a very small additional amount of trouble to the navigator, the tables constructed for 24 miles, as the value of the larger intercept, might be made to apply to all cases, and then only a few pages of tabular matter would amply suffice.

From a moment's consideration of the diagram it will be seen that, so long as the angle AOB is constant, the angles θ, ϕ will retain the same values if the intercepts a, b are multiplied by a common factor m, so that they become ma, mb, m being greater or less than unity.

If then the larger intercept has any value other than 24, we may find the value for the smaller intercept with which to enter the standard table constructed for 24 miles, as follows:

Let a', b' be the new values for larger and smaller intercepts, x the tabular value for the smaller intercept, with which to enter table. Then

$$x = \frac{b'}{a'} 24.$$

That is, the value for smaller intercept must have the same ratio to the actual smaller intercept that 24 has to the actual larger intercept.

Thus, suppose 11, 5 are the actual values. Then

$$x = \frac{24}{11} 5 = \frac{120}{11} = 11 \text{ nearly.}$$

The appropriate value for the smaller intercept, with which to enter table, being thus selected, θ is taken out unaltered.

With regard to the length of OP, since

$$OP = \frac{AB}{\sin AOB},$$

and since, if a, b are changed to ma, mb, AB becomes mAB, it follows that the value of OP from table must be multiplied by m, that is, by the ratio of the actual larger intercept to 24, the standard value for which the table is constructed.

In the small auxiliary table, therefore, should be given at the head of each column a factor by which the value of OP taken from the table must be multiplied, F being simply the ratio of the actual larger intercept to 24.

The following extract will show the form of the proposed table:

TABLE.

Larger intercept	10	9
Factor F	.42	.38
Smaller intercept	....	....
9	21.6	....
8	19.1	21.3
7	16.8	18.7
6	14.4	16
5	12	13.3
4	9.6	10.7
3	7.2	8
2	4.8	5.3
1	2.4	2.7

Assuming then that the intercepts have been obtained by comparing the true or observed with the calculated zenith distances, the several steps will be as follows:

(1) With actual larger intercept as argument, look out in Table A the value for smaller intercept to be taken as argument in standard Table B.

(2) From Table B take out the value of θ to be applied to the direction of the position-line given by the smaller intercept, and also the value of OP.

(3) Apply the angle θ to find course, and multiply the tabular value of OP by F, to find actual value for distance.

(4) With this course and distance calculate latitude and longitude of P by traverse table.

The data following, being details of observations taken at sea more than sixty years ago, culled from an ancient work-book kindly placed at the disposal of the writer by Admiral Sir Walter Hunt-Grubbe, of the British Navy,[5] may serve to illustrate the procedure.

September 23, 1850. D. R. position at $2^h\ 48^m$ G. M. T., Lat. 38° N., Long. 1° E.

Corrected Altitudes.	Greenwich M. T.	True Bearings.
29° 34′	$20^h\ 32^m\ 56^s$	S. 65° E.
35° 32′	$2^h\ 48^m\ 4^s$	S. 56° W.

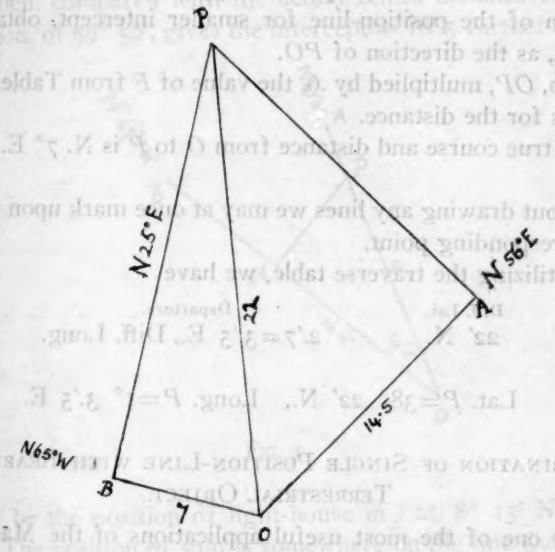


FIG. 2.

Between the observations the ship ran N. 73° W., 28 miles. This was allowed for in the correction of the first altitude, which was thus reduced to the position of the second D. R. place of observation (38° N. 1° E.).

[5] These observations, which may claim a slight historic interest, were taken by the distinguished admiral when serving as a midshipman on board H. M. S. *Bellerophon*. They were worked as a "double chronometer," and the work is prefaced by a short account of the Sumner process entitled, "A Method of Finding the True Place of a Ship, the Latitude not being Known. (By an American.)"

This was probably one of the first applications of what was then a comparatively new method in actual practice at sea.

From O lay off the intercepts, from the forenoon observation OB N. 65° W., 7 miles, from the afternoon observation N. 56° E., 14.5 miles.

From Table A we take out the number 11.6 corresponding to smaller intercept 7, larger 14.5, and also factor $F=.6$, by which OP as taken from the tables, is in the end to be multiplied.

The angle between intercepts is 121°, the sum of 56° and 65°. Entering Table B with this value, we have for the smaller intercept

$$\theta=18°.4, \quad OP=36.8.$$

For the course: At the point P apply 18°.4 to N. 25° E., the direction of the position-line for smaller intercept, obtaining S. 6°.6 W., as the direction of PO.

Again, OP, multiplied by .6, the value of F from Table A, gives 22 miles for the distance.

Thus true course and distance from O to P is N. 7° E. 22 miles nearly.

Without drawing any lines we may at once mark upon the chart the corresponding point.

Or, utilizing the traverse table, we have

Diff. Lat.	Departure.
22′ N.	2.′7=3.′5 E., Diff. Long.

Thus,

Lat. $P=38°$ 22′ N., Long. $P=1°$ 3.′5 E.

COMBINATION OF SINGLE POSITION-LINE WITH BEARING OF TERRESTRIAL OBJECT.

Quite one of the most useful applications of the Marcq position-lines is the combination of a single line deduced from the altitude of a heavenly body with the true bearing of a terrestrial object, such as a headland or light-house. In such cases the "course and distance" process offers so simple a method of treatment that no special table is required, and with the aid of a rough diagram the solution by means of the ordinary traverse table becomes at once obvious.

Without any verbal rules the method of procedure in this case will be best exemplified by means of a practical example.

Example 7, from the work by Mr. Simpson-Baikie, to which allusion has already been made, will answer the purpose. The following are the data:

December 21, 1907, when the sun's bearing was S. 49½° E., the true altitude was 40° 10′, the bearing of Minikoi light-house (Lat. 8° 15′ N., Long. 73° E.) being S. 20° E. Required, the position of ship.

It should be remarked that Mr. Baikie very wisely adopts the practice of working with the latitude and longitude of the point observed as the assumed position. By this device the work of deducing the true latitude and longitude is very much simplified.

In this case the altitude found by calculation with the assumed latitude and longitude was 40° 26′.5 giving zenith distance 49° 33′.5, which, compared with the actual zenith distance found by observation, of 49° 50′, gives the intercept as 16′.5 further off.

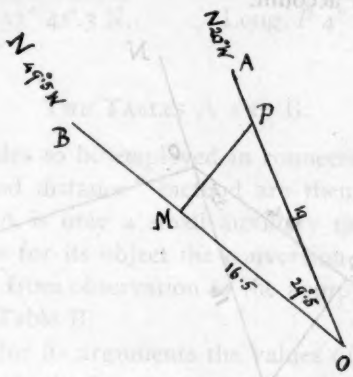


FIG. 3.

Let O be the position of light-house in Lat. 8° 15′ N., Long. 73° E. The position of ship is somewhere on the line OA, drawn through O N. 20° W. From O lay off OB N. 49½° W., directly away from sun. In OB take OM 16.5 miles, and at M draw MP at right angles to OM, intersecting OA in P, the position of ship. Then

$$OP = OM \sec 29°.5,$$

the angle 29°.5 being the inclination of the two position-lines.

Entering the traverse table with 16.5 as Diff. Lat., and 29°.5 as course, we find distance to be 19 miles, which is the required distance from light-house to ship.

And by hypothesis the course is N. 20° W., the reversed bearing of light-house.

Thus, the course and distance from light-house to ship is N. 20° W. 19 miles. Entering the traverse table, we have for these values

Diff. Lat. 17′.9 N., Dep. 6′.5, giving Diff. Long. 7′ W. nearly.

Whence

$$\text{Lat.} = 8° 15′ \text{ N.} + 18′ \text{ N.} = 8° 33′ \text{ N.}$$

$$\text{Long.} = 73° \text{ E.} - 7′ \text{ W.} = 72° 53′ \text{ E.}$$

THE CASE IN WHICH AN INTERCEPT VANISHES.

A case, in many respects analogous to that just considered, arises when one of the intercepts vanishes, or when it is so small that it may be left out of account.

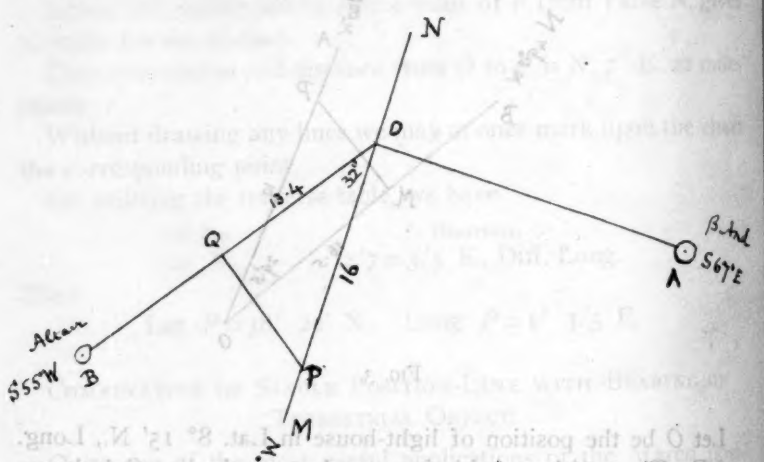


FIG. 4.

Such an instance we find in Example IV of Walker, the data being as follows:

October 16, 1899. D. R. 53° 55′ N. 4° W.

	Bearing.	Intercept.
Altair,	S. 55° W.	13.4 nearer.
β Andromedae,	S. 67° E.	.6 further off.

From *O*, the assumed position, lay off *OA* S. 67° E. Then if we neglect the small intercept, little more than half a mile, for β Andromedae, the place of the ship lies upon the line *MON* running N. 23° E. and S. 23° W.

Again, from O lay off OB S. 55° W. Upon this line take OQ 13.4 miles, and through Q draw QP at right angles to OB, intersecting OM in P, the position of ship.

From the traverse table we have, for Diff. Lat. 13.4, course 32° (difference between S. 55° W. and S. 23° W.), the distance 16 miles, which is the required distance from O to P. And the course from O to P is S. 23° W.

Under 16 miles S. 23° W. we have for Diff. Lat. 14.7 miles, for departure 6.2 miles, which gives 10'.5 Diff. Long. nearly.

Lat.	53° 55′ N.	Long.	4° 00′ W.
	14′.7 S.		10′.5 W.
Lat. P	53° 41′.3 N.	Long. P	4° 10′.5 W.

THE TABLES A AND B.

The special tables to be employed in connection with the proposed "course and distance" method are then two in number. Of these, Table A is only a small auxiliary table of some 260 entries, which has for its object the conversion of the actual intercepts resulting from observation to the appropriate arguments for the standard Table B.

This table has for its arguments the values of the greater and smaller intercepts, in the first case extending from 2 to 23, in the latter from 1 to 22.

At the head of each vertical column is given the value of the factor "F," by which the value of OP taken from the tables has to be multiplied, as has been already explained.

The proper argument having been determined from Table A for the smaller intercept, we enter Table B, and thence obtain (1) the angle θ, which is the angle of inclination for OP to the position-line of the smaller intercept, and (2) the distance OP, subject to multiplication by the factor F.

The value of the larger intercept is taken as constant at 24. The other arguments are the angle included between intercepts, proceeding by intervals of 2° from 26° to 154° and the smaller intercept, as taken from Table A.

If the actual value of the larger intercept happens to be exactly or approximately 24, there is of course no occasion to refer to Table A, but we enter Table B with the actual value of smaller intercept. If one of the intercepts exceeds 24, we have only to divide each by 2 and proceed as usual, except that in compensation

TABLE A.

AUXILIARY TABLE, FOR FINDING VALUE FOR SMALLER INTERCEPT, TO BE USED AS ARGUMENT IN TABLE B.

Larger intercept	23	22	15	14	10	9
Factor *F*	.96	.92	.62	.58	.42	.38
Smaller intercept	....	....	....	....	....	....
22	23	....	....	....	....	....
21	21.9	23	....	....	....	....
20	20.9	21.8	....	....	....	....
19	19.8	20.7	....	....	....	....
18	18.8	19.6	....	....	....	....
17	17.7	18.5	....	....	....	....
16	16.7	17.4	....	....	....	....
15	15.7	16.4	....	....	....	....
14	14.6	15.3	22.4	....	....	....
13	13.6	14.2	20.8	22.3	....	....
12	12.6	13.1	19.2	20.6	....	....
11	11.5	12	17.6	18.8	....	....
10	10.4	11	16	17.2	....	....
9	9.4	9.8	14.4	15.4	21.6	....
8	8.3	8.7	12.8	13.7	19.1	21.3
7	7.3	7.6	11.2	12	16.8	18.7
6	6.3	6.5	9.6	10.3	14.4	16
5	5.2	5.5	8	8.6	12	13.3
4	4.2	4.4	6.4	6.9	9.6	10.7
3	3.1	3.3	4.8	5.1	7.2	8
2	2.1	2.2	3.2	3.4	4.8	5.3
1	1	1.1	1.6	1.7	2.4	2.7

OP, as taken from table, has to be multiplied by $2F$, instead of F. The extracts which follow will perhaps illustrate sufficiently the structure of Tables A, B, and will also be found to contain all the details necessary for the solution of the practical examples given later, selected from the works of Messrs. Cross and Walker, to which reference has been already made.

TABLE B.

FOR FINDING θ, THE INCLINATION OF OP TO THE POSITION-LINE FOR SMALLER INTERCEPT, AND ALSO THE VALUE OF OP.

LARGER INTERCEPT 24.

Smaller intercept	Angle included between intercepts													
	42°		56°		104°		118°		120°		122°		132°	
	Angle θ	OP	Angle θ	OP	Angle θ	OP	Angle θ	OP	Angle θ	OP	Angle θ	OP	Angle θ	OP
	° ′		° ′		° ′		° ′		° ′		° ′		° ′	
24	69	25.7	62	27.2	38	39	31	46.6	30	48	29	49.5	24	59
23	65.8	25.2	59.7	26.6	37	38.1	30.3	45.7	29.3	47	28.4	48.5	23.5	57.8
22	62.5	24.8	57.3	26.2	36.1	37.4	29.5	44.7	28.6	46	27.6	47.5	22.9	56.5
21	59.1	24.5	54.9	25.7	35	36.6	28.7	43.7	27.8	45	26.9	46.4	22.3	55.3
20	55.7	24.2	52.3	25.4	33.9	35.8	27.9	42.8	27	44	26.1	45.4	21.7	54.1
19	52.2	24.1	49.7	24.9	32.8	35	27	41.8	26.2	43.1	25.3	44.4	21	52.9
18	48.6	24	47	24.6	31.6	34.3	26.1	40.9	25.3	42.1	24.5	43.5	20.4	51.7
17	45	24	44.2	24.4	30.4	33.6	25.1	40	24.4	41.2	23.6	42.5	19.7	50.6
16	41.5	24.1	41.4	24.2	29.1	33	24.2	39.1	23.4	40.3	22.7	41.5	18.9	49.4
15	38	24.4	38.5	24.1	27.8	32.2	23.2	38.2	22.4	39.5	21.7	40.6	18.1	48.2
14	34.6	24.6	35.7	24	26.4	31.5	22	37.4	21.4	38.4	20.7	39.6	17.3	47
13	31.3	25	32.8	24	24.9	30.9	20.9	36.5	20.3	37.6	19.7	38.7	16.5	45.9
12	28	25.6	29.9	24	23.6	30.2	19.7	35.6	19.1	36.7	18.5	37.8	15.6	44.7
11	25	26.1	27.1	24.2	21.8	29.6	18.4	34.8	17.9	35.8	17.4	36.9	14.6	43.6
10	22	26.8	24.3	24.4	20.2	29	17.1	34	16.6	34.9	16.2	36	13.6	42.5
9	19.2	27.4	21.5	24.6	18.5	28.4	15.7	33.2	15.3	34.1	14.9	35.1	12.6	41.4
8	16.5	28.2	18.7	24.8	16.7	27.9	14.3	32.4	13.9	33.3	13.5	34.3	11.5	40.3
7	14	28.9	16.1	25.2	14.8	27.4	12.8	31.7	12.4	32.5	12.1	33.4	10.4	39.3
6	11.6	29.8	13.6	25.6	12.9	26.9	11.2	30.9	10.9	31.7	10.6	32.6	9.1	38.1
5	9.4	30.7	11.1	26.1	10.9	26.4	9.5	30.2	9.3	31	9.1	31.8	7.7	37.1
4	7.3	31.6	8.7	26.6	8.8	26	7.8	29.6	7.6	30.3	7.4	31.1	6.4	36.1
3	5.3	32.7	6.4	27.1	6.7	25.7	5.9	28.9	5.8	29.6	7.6	30.3	4.9	35.1
2	3.4	33.8	4.2	27.6	4.5	25.3	4.1	28.3	4	28.9	3.9	29.7	3.4	34.1
1	1.7	34.7	2	28.3	2.3	25	2.4	27.7	2	28.3	2	28.9	1.7	33.2

PRACTICAL EXAMPLES IN USE OF TABLES.

Example III (Walker, p. 35).—D. R. position, 53° 40′ N. 115° 15′ E.

Bearings.	Intercepts.
N. 89° E.	18′ nearer.
S. 43° E.	22′ further.

Angle included, 132°. Position-line for smaller intercept, S. 1° E.

From Table A, with larger intercept 22, smaller intercept 18, we have argument for Table B 19.6, $F = .92$.

From Table B, with included angle 132°, smaller intercept 19.6, we find $\theta = 21°.5$, $OP = 53.5$.

Applying 21°.5 to S. 1° E., we have S. 20°.5 W. for direction of position-line at P. And $OP = 53'.5 \times .92 = 49'.2$.

Thus, the course and distance from O to P equal N. 20°.5 E., 49′, and the latitude and longitude of P will be found to be 54° 26′ N., 115° 44′.5 E.

Example V (Walker, p. 50).—D. R. position, 54° N. 5° W.

	Bearings.	Intercepts.
Arcturus,	S. 67° E.	15.′1 further.
Venus,	S. 25° E.	13.′5 further.

Angle included, 42°. Position-line for Venus, N. 65° E.

From Table A, argument is 21.5, $F = .62$.

From B, $\theta = 61°$; direction of PO, N. $(65° + 61°)$ E. = S. 54° E.

And $OP = 24'.7 \times .62 = 15'.3$.

Thus, course and distance from 54° N. 5° W. is N. 54° W. 15′.3, and

Lat. P = 54° 9′ N., Long. P = 5° 21′ W.

Example (Cross, p. 22).—D. R. position, 34° 47′ S. 12° 21′ W.

	Bearings.	Intercepts.
Altair,	N. 48° W.	5′ further.
α Centauri,	S. 28° W.	9′.5 further.

Angle included, 104°. Position-line for Altair, N. 42° E.

From Table A, argument is 12.7, $F = .4$.

From Table B, θ is 24°.5 and OP runs N. 66°.5 E.

$$OP = 30'.7 \times .4 = 12'.3.$$

Course and distance, N. 66°.5 E. 12′.3.

Lat. P, 34° 42′ S., Long. P, 12° 7′ W.

Example (Cross, p. 28).—D. R. position, 39° 10′ S. 60° 45′ E.

	Bearings.	Intercepts.
Sun,	N. 61° E.	29′ nearer.
Sun,	N. 5° E.	45′ nearer.

In this case, both the intercepts lie outside the limits of our tables. Each, therefore, must be divided by 2, the tabular value of OP being multiplied by $2F$ instead of F, as already explained.

With arguments 22.5, 14.5 we have, from Table A, argument for Table B 15.5, $2F = 1.88$. Position-line for smaller intercept, S. 29° E.

From Table B, for included angle 56° $\theta = 40°$, $OP = 24.1 \times 1.88 = 45'.3$.

Course and distance, N. 11° E. 45′. Lat. *P*, 38° 26′ S., Long. *P*, 60° 56′ E. Owing to its official adoption by so many of the leading navies, the St. Hilaire method has made of late rapid strides in popular favor, but its progress would probably have been still more marked but for the lack of some simple method of treating numerically the final stage of the problem, in the same way as what is known as the "double chronometer" is dealt with by means of Johnson's "cloudy weather" table. This deficiency it is hoped that the two simple tables from which extracts have been given, extending only to a few hundred entries, and involving but a few pages of printed matter, may do some little to remedy.

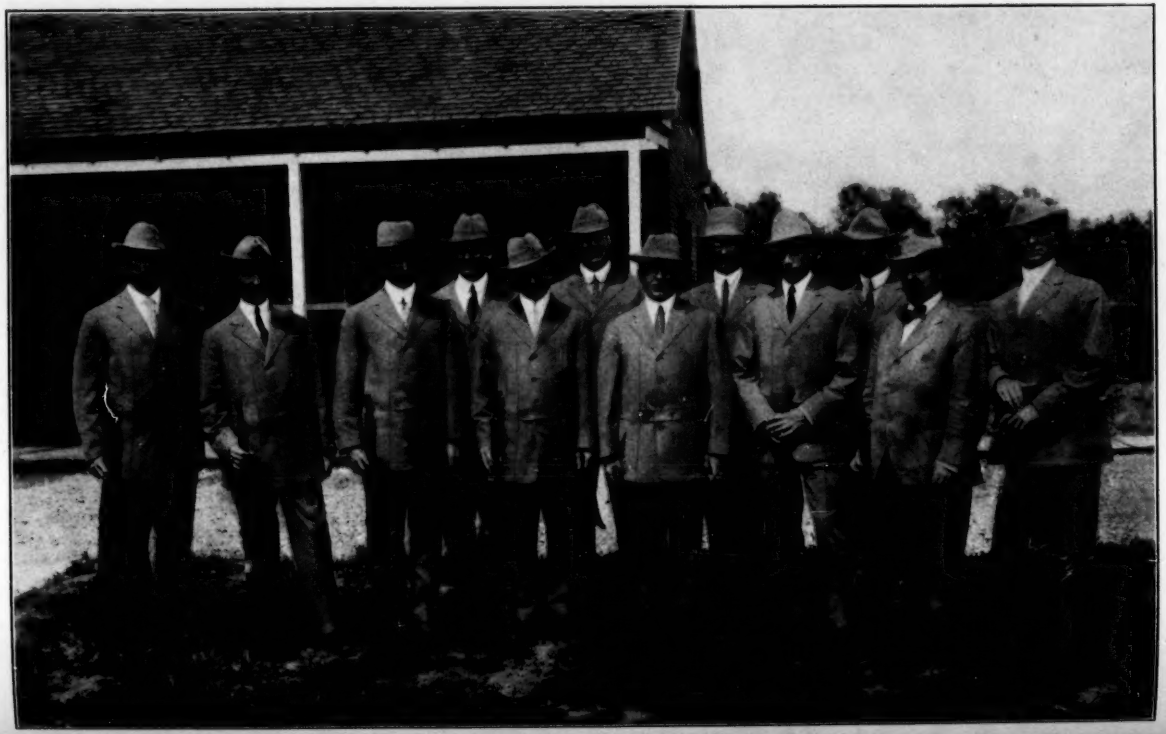
DISCUSSION.

The Geometry of the Marcq Position-Lines.

LIEUT.-COMMANDER C. P. SNYDER, U. S. Navy.—As stated in the author's opening paragraphs, the handling of the later steps of finding the "fix" in case of position-lines is somewhat more difficult by *computation* from calculated altitudes than the methods by computation of finding the "fix" where we use computed longitudes or latitudes themselves, as in the "Chord Method" of Muir, "Johnson's Method," etc. But the reverse of the above is true in plotting to obtain the fix, *i. e.*, the plotting of lines from calculated altitudes is generally considered simpler, or at least accomplished with greater facility than plotting lines obtained by other methods or by computing the fixes. The author's suggested method and tables, therefore, furnish us a simplification of what has previously been a deterrent in the adoption of the Marcq St. Hilaire Method, at least for *those* who do not believe that the whole subject of handling lines of position is merely a question of *chart work*. Surely a naval officer should know both methods of obtaining a "fix": "plotting" and "computation."

Some enthusiasts insist that "plotting" is the only thing, and yet they are generally those who extol the "H. A. Sailor"; very well, let them read the author's quotation from "Lecky," who can most assuredly be designated as a sailor of said type, in which he, Lecky, condemns "*plotting*" itself for any but the fairest weather. On our modern ships and with our appliances *we can* plot under almost any conditions, but I think that *we* should be able to *compute* as well as *plot*.

Hence, as Mr. Goodwin's article supplies us with a means to clear away fancied difficulties, it belongs in the category of those articles which should receive publicity to navigators. If its publication brings about discussion among even a *few* officers upon this subject it will accomplish something; particularly if the discussion drifts into the question of whether we should adopt *one* standard method and *one* only, or can be more liberal and admit that there is virtue in both "plotting" and "computation"—hence adopt a middle course, and *know* both, using each where it is most applicable.



THE UNITED STATES "OLYMPIC" RIFLE TEAM OF 1912.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

RIFLE SHOOTING AT THE OLYMPIC GAMES OF 1912.

By LIEUT.-COMMANDER HARRIS LANING, U. S. Navy,
Captain of the U. S. Olympic Rifle Team.

While a great deal of attention has been paid by the press of the country to the part played by our athletes in the Olympic Games, held in Stockholm, Sweden, last summer, very little has been told about the shooting features of that great competition. Yet shooting formed a considerable part of the games and had a very decided effect on the final standing of the leading countries. That shooting was overlooked in the daily press in this country was due largely to the fact that the representatives of the press of the United States not only knew very little about the shooting game, but did not even arrive at the games until after some of the most important shooting events had been completed. Furthermore, the press of this country has never taken much interest in rifle shooting, and though the big rifle matches of the country involve an enormous number of competitors, they are rarely even reported by the big newspapers and certainly are never treated as fully as are other competitive events. Take for instance the National Rifle Matches, provided for by Congress, where between forty-five and fifty teams, representing the several branches of the regular service and practically every state in the Union, compete; little or no notice is taken of the event by the newspapers. And yet the rifle teams in those matches represent longer and more careful training than football teams, and put up a quality of shooting that is marvellous. That the United States pays less attention to its shooting men than any other country is well known to all riflemen, and it was particularly impressed on the shooting members of the Olympic team this year when they found the home press gave but scant recognition of their work, as compared with that of the athletes. The readers of English papers were given full accounts of the rifle matches,

and what our shooters did in Stockholm is better known in England than it is here. It is with the idea of bringing the attention of the readers of the Institute to the excellent work done by our rifle team that this article is undertaken.

In the United States we find the idea, fostered by the press, that the Olympic Games are purely athletic competitions. They are not and never have been. In ancient days the games were almost exclusively of the Spartan type; that is, they were games that tested the skill and endurance of men with a special view to war. The games gradually broadened until they covered almost every kind of competition, including athletics. Athletics, however, came to dominate and the other competitions, being fewer in number, became in the eyes of the public secondary to the athletic events. To such an extent have athletics recently dominated that we frequently hear the athletes complain of the fact that there are any other features of the games at all. The International Olympic Committee, however, has an entirely different idea, and it is probable that the 1916 games, to be held in Berlin, will not only retain all the old events, but will also bring out many new kinds of competitions. At the Stockholm games the competitions were divided as follows:

1. Athletics, with 26 individual events and 5 team events.
2. Cycling, with one combined individual and team event of 200 miles.
3. Fencing, with 5 events.
4. Football (association), in which the teams representing the various nations played on the system of elimination by defeat.
5. Horse riding competitions, with 3 events.
6. Lawn tennis, with 4 events.
7. Gymnastics, with 4 events.
8. The modern pentathlon (an all-around test for a soldier of to-day).
9. Rowing, 4 events.
10. Swimming, 11 individual and 3 team events.
11. Wrestling (Græco-Roman style), 5 weights.
12. Yacht racing, 4 classes.
13. Shooting, divided into six groups as follows:
    (a) Military rifle shooting, 3 events.
    (b) Any-rifle shooting, 2 events.

(c) Miniature-rifle shooting, 4 events.
(d) Running-deer shooting (with rifles), 3 events.
(e) Revolver and pistol shooting, 4 events.
(f) Clay bird shooting (shot-guns), 2 events.

It will be seen that there were in all some 96 separate competitions, of which 18 were shooting events.

The American Olympic Games Committee divided the work of selecting and preparing teams for the different branches among the various national associations that govern the competitions held in this country in their respective branches. The shooting part was turned over as follows: The rifle shooting to the National Rifle Association of America; the revolver shooting and pistol shooting to the United States Revolver Association; and the shot-gun shooting to the Interstate Association for the Promotion of Clay Bird Shooting. In order to get representative teams it became necessary to hold try-outs for places on the teams, and each national organization therefore held such a try-out to select its team members. These try-outs were really more gruelling than the Olympic matches, and the men who made their places on the teams deserved to be there.

While both the pistol and shot-gun teams did wonderful work, it is not my intention to go into it. They were entirely separate from the rifle team, with which I was connected, and their story does not belong to me.

The National Rifle Association of America, having been designated to organize our rifle team, set about its work in January, some six months before the games. Before anything else could be done, it was necessary to finance the team. Subscriptions toward the team were asked for, and it soon became apparent that the financial side could be cared for. The National Rifle Association then considered the teams and their make-up. It will be noted that there were four distinct rifle teams provided for in the games: (1) a military team (composed of six firing members and three alternates), (2) an any-rifle team (composed of six members and three alternates); (3) a miniature-rifle team (composed of four members and two alternates); and (4) a running-deer team (composed of four members and two alternates). The National Rifle Association realized at once that as it would cost over $500.00 for each man sent, the four teams called for were more than they could afford to send over; so they decided

to select a team of military riflemen, and from that team make up teams to enter the other events with rifles. This was not the best thing to do, but under the circumstances was the only thing that could be done, especially as the only kind of rifle shooting that is highly developed in this country is with the military rifle. It was therefore decided to build up the strongest military team possible and trust to the natural shooting ability of the members of that team to pull them through the other kinds of shooting. The National Rifle Association requested the Navy Department to detail me for duty as the captain of the rifle team, and in March my orders were issued. From that time on I worked with the team.

The try-outs for places on the rifle team were held on the U. S. Marine Corps Rifle Range at Winthrop, Md., May 16-20. For some weeks previous, military marksmen all over the United States had known of this competition for places on the Olympic Rifle Team, to which each state or regular service organization could send six representatives. From all the representatives the best eight were to be chosen by try-out for the team.

This plan eliminated from the try-outs all but the best shots in each organization, so when forty-odd competitors gathered at Winthrop they represented the cream of military shots of the country. The navy, marine corps, infantry, cavalry, and the national guards of various states were represented. Every man went there to make a place on the team and was ready to fight for it for all there was in him. To make a place on that team meant a great deal to those men, for it at once placed them at the top of the military marksmen of this country and, if the team won in Stockholm, at the top of the military marksmen of the whole world.

As the principal event of the military matches of the Olympic Games was to be the "international team match," it was decided that the try-outs for places on the team should be the same as this match, but *shot through four times*, once each day for four days. At the end of the third day all the competitors except the highest twenty-five were to be eliminated, as it was conceded that no one who stood lower than twenty-five could in one day's shooting pull himself to eighth place or above.

The conditions of the international team match were as follows:

Ranges: 200, 400, 500, and 600 meters (=respectively to 218.72, 437.44, 546.8, and 656.16 yards).

Targets: White with black bull's-eyes. (Pictures of the targets with the dimensions are shown below.)

Position: Any without artificial rest.

Number of shots: Each competitor fires two sighting shots and fifteen shots for record at each range.

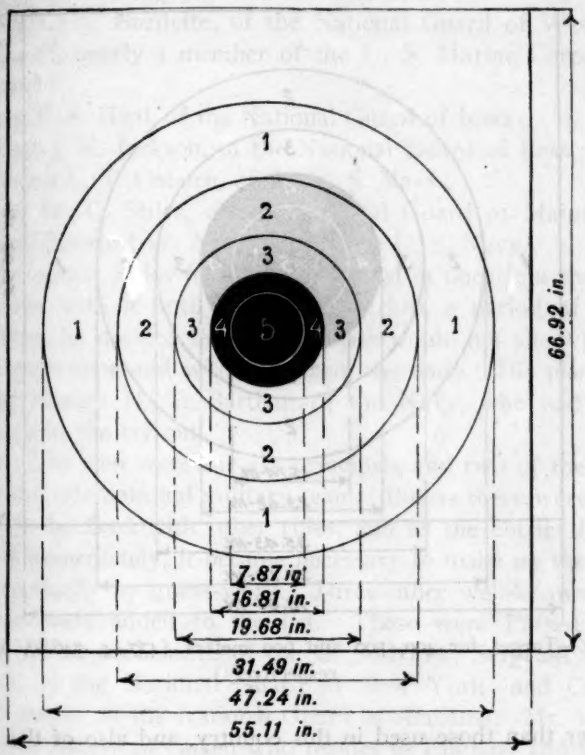


FIG. 1.—Target for 200 meters (218.72 yds.).

Arm: The national military arm of the country according to the adopted model of the country, without any alteration or addition.

Sights: Regulation, but not telescopic or magnifying.

Ammunition: Any kind.

Trigger pull: Not less than *four* pounds.

Rifle slings: If used, must be regulation and used only as a support to one arm.

The *center* of the shot hole determines the value of the shot. When one thinks of the long ranges used in the big matches in this country, he is apt to believe that the shorter ranges used in the international match were very easy. Note must however be made of the size of the targets, which are relatively much

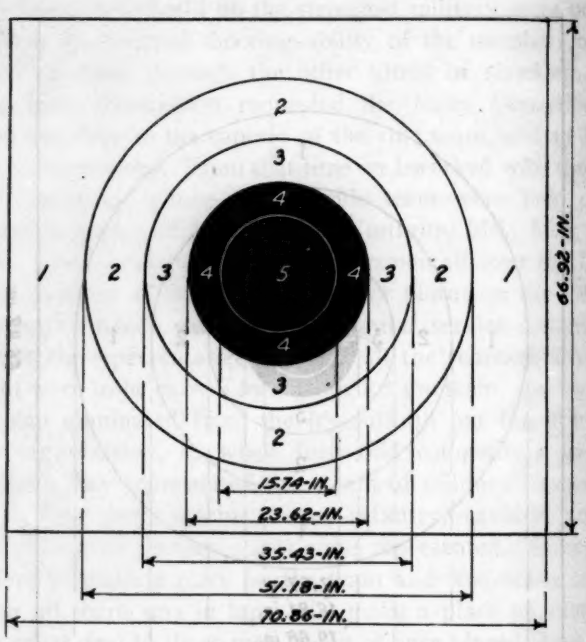


FIG. 2.—Target for 400, 500 and 600 meters (437.44, 546.80, 656.16 yds. respectively).

smaller than those used in this country, and also of the fact that in counting the value of hits the center of the bullet hole is counted instead of the inner edge. Again the match was hard because for each man it involved the firing in a short time of 68 perfectly fired shots, and a constant study of the changing conditions during that time. To go through this strain for four days in succession, in competition with other men, who were also fighting, was not only very hard physical work but was also very trying on the eyes and nerves; and the try-out therefore eliminated all who were not strong in physique, as well as those who could not keep up their fine shooting under the severe strain of

a long and hard match. The winners of places on the team were the hardest fighters among the best shots in the country, and such a team is hard to beat.

The eight men who won their places by the try-out were:

Sergeant Harry Adams, of the U. S. Cavalry;

Captain A. L. Briggs, of the U. S. Infantry;

Captain C. L. Burdette, of the National Guard of West Virginia (formerly a member of the U. S. Marine Corps Rifle Team);

Captain F. S. Hird, of the National Guard of Iowa;

Sergeant J. E. Jackson, of the National Guard of Iowa;

Lieutenant C. T. Osburn, of the U. S. Navy;

Captain W. C. Stiles, of the National Guard of Maine; and

Hospital Steward W. A. Sprout, of the U. S. Navy.

When Captain Stiles found that he must at once join the team and remain with it until after the matches, a period of about two months, he decided that his business would not allow him to take so much time and withdrew from the team. His place was taken by Ensign H. T. Bartlett, of the Navy, who had made ninth place in the try-out.

These eight men were the six principals and two of the alternates of the international military team. But as there were other matches to be fired with other rifles, and as the entries had to be mailed immediately, it became necessary to make up the other teams practically by guess-work. Three other well-known military shots were added to the list. These were Passed Asst. Surgeon W. N. McDonnel, of the U. S. Navy; Sergeant W. F. Leushner, of the National Guard of New York; and Captain E. L. Anderson, of the National Guard of Alabama. Mr. Walter Winans, an American citizen who resides in England and who is a famous running-deer shot, volunteered for the running-deer team and was selected. Lieut.-Colonel Wm. Libbey, of the National Guard of New Jersey, had already been chosen for adjutant and quartermaster of the team and was also put on the running-deer team.

It will be noted that with the exception of Winans all the above-named men were military riflemen. With the exception of Captain Anderson none were miniature-rifle shots. With the exception of Winans (who was in Europe and joined the team only three days before the matches), none had ever seen a run-

ning-deer match, much less competed in one. And not one man connected with the team knew anything at all about the any-rifle shooting (called "match-rifle" shooting abroad), which is highly developed in Europe. We were out primarily to win the international team match and thus retain the military championship of the world, and winning that our mission would be successful; but if we could win other events too, so much the better. But my instructions were to let nothing interfere with winning the big team match.

The team had, all told, twelve firing men, and these were grouped for the matches as follows:

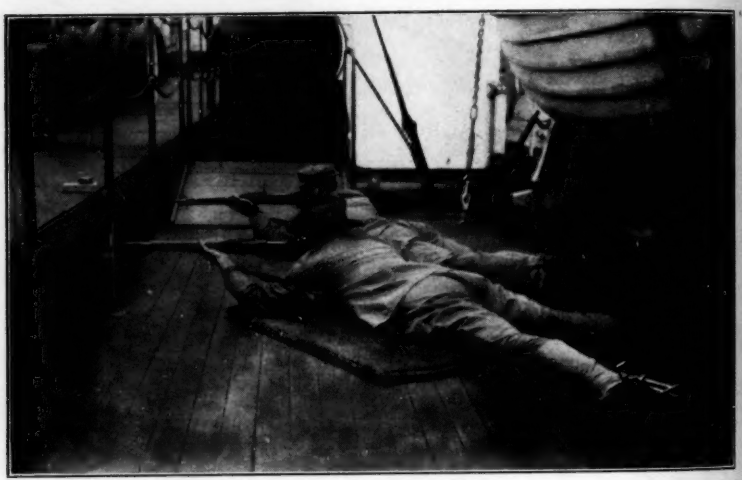
Military	Running-Deer	Any-Rifle	Miniature
Burdette	Winans	Burdette	Leushner
Adams	Leushner	Adams	Osburn
Jackson	McDonnel	Jackson	Sprout
Briggs	Libbey	Briggs	Hird
Sprout	Adams	Sprout	McDonnel
Osburn		Osburn	Anderson
Hird		Hird	
Bartlett		Bartlett	
McDonnel		McDonnel	

The team having been selected, it was taken to Annapolis, where there was two weeks' training on the Naval Academy range. With a team made up of such excellent shots, it does not take long to work out the team system; and preparing the military team was not especially difficult, though it took practically all the time allowed for training. Each man and each rifle had to be studied until they were all brought to shoot alike, so that when one man would make a center bull's-eye, all could do the same. Each man had two new and untried rifles, which, though carefully selected, required much adjusting to make them absolutely perfect arms. A properly trained and systematized rifle team is one that makes the most out of every shot. Instead of the team's score being merely the sum of six individual scores, it is the sum of the scores of six men shooting at once, each shot as it is fired conveying information to every other member of the team. If one shot went out either laterally or vertically, every man on the team at once used the knowledge to correct an error that would put succeeding shots out of the bull's-eye. To develop this in a team is usually a long process, but we were able to do it and perfect it in the time allowed.

The preparation for the matches other than the military team match was scant, for we had very little time for such work. It must be remembered that not only were these matches new to our men, but at least two of them have never been fired in this country and the others fired but very little. These special departments of rifle shooting never having been developed, we had great difficulty in getting rifles suitable to fire in them. For the running-deer and miniature matches we used sporting rifles bought from stock. We were not even sure the rifles were suitable to the game, for they had never been tried. For the "any-rifle match" we had to use our Springfields, for there were no other rifles of sufficient power to be had in the country. With makeshift material of this kind we were still only slightly preparing ourselves to enter matches against teams whose equipments represented the result of years of study and practice, and whose members were specialists in their respective branches. But it was not our tools or lack of time that gave us the greatest bother, for we knew that with such men as we had the tools would be made to work. We were bothered more by the fact that the rules for the matches were so vague and obscure that we did not know what we could do or could not do. Our difficulty was to learn the games thoroughly from incomplete rules and to do it in the odd moments we might find during the two weeks. Our work was especially difficult from the fact that we had but twelve men from whom to make up the four teams, whereas other countries had a team for each branch, each team being made up of men who had specialized in that branch and who rarely did any other kind of shooting. We did not succeed in beating all the others in these matches, but that we did get places in nearly all of them must redound to the credit of our military marksmen.

The team trained on the Naval Academy range until June 13, when we left for New York to take passage on the *S. S. Finland*, which had been chartered by the American Olympic Games Committee to take the United States team to Stockholm and to remain there during the games as quarters for the team. The *Finland* left New York on June 14, and was due to arrive in Antwerp on the 23d, and in Stockholm on the 29th. On the trip across the Atlantic all the contestants managed to get some sort of training, and many remarkable devices were brought into play. The rifle team had rather more difficulty than most, for we could not im-

provise a range for our high-power rifles, and yet not only were the holding muscles to be kept in condition, but also the eyes and the shoulders of the team members. A regular routine of training that covered about three hours a day was laid out. Aiming and snapping at miniature targets took about half or three-quarters of an hour. This was followed by aiming and snapping drill with the rifle-dotter device, which in turn was followed by actually firing a number of rounds over the side. A bullet stop for the 22-caliber rifles was put up on the boat deck, and actual practice with that rifle was carried out. Each day, after the regular practice had been carried out, a short setting-up drill



PRACTICING WITH THE HOLLAFIELD TARGET ROD ON BOARD THE "FINLAND."

would be given, and in the afternoon each team member was required to walk for one hour. This daily training kept the men in splendid physical condition, and they were easily in shape for the matches after two days on the range in Stockholm.

The *Finland* was one day late in getting to Antwerp, but as she was not due in Stockholm until June 29 in any event, and as the shooting began on that day, it was necessary that all the shooters be taken to Stockholm by rail. Arrangements had already been made for this trip, and immediately upon our arrival in Antwerp we proceeded by rail to Stockholm, where we arrived on June 26. Our big match, the International, came off on the 29th, and

we therefore had, after two weeks' travel, only two days to get in condition, study the range, and put on the finishing touches. We were one of the last teams to arrive, as it was; but had we remained on the *Finland* we would have missed the big match entirely, as the ship was again delayed and did not get to Stockholm until the 30th.

The two days' practice on the range was a great blessing to us, for without it we would have had no chance against the British team, which had been there a week, nor against the Swedes, who had been practising on the range for months. We found, however, that the *only* match we could really prepare for was the international, for the firing was so arranged that it took all day to cover the four distances involved in that match, and the ranges where the other kinds of rifle matches were to be held were so far away that one had to devote half a day to get to one and have any practice at all. We at once gave up hope of getting any preparation there for anything but the international team match; and we needed all our time for that, for the military rifle range at Stockholm is one of the most difficult ranges to shoot over I have ever seen. It is set in a valley, the surrounding hills being densely wooded. Small ravines entering the valley from various directions act as funnels out of which pour combinations of wind that for variations in force and direction are remarkable. The low altitude of the sun and the peculiar light it seems to give keep the eyes always strained. The rough ground, the cobblestone firing points, the peculiar way of scoring and indicating shots, the entirely new order of fire put upon us, and a dozen other things tended to upset our team and to handicap them. But the worst blow of all was the announcement that individual telescopes could not be used on the firing line. In all previous international matches each firer has been allowed to use a small telescope. He used this to get the value and location of his hits and also to "read the mirage," which tells him what the wind is doing. In the use of telescopes the American and English teams have always excelled, and there was a decided gloom in those teams when we were told that the glasses could not be used. Other teams had known this long before, but through some oversight we were not informed until after our arrival in Stockholm. While this hurt our team, we made no complaint but determined to play under any rules that were put forth and to win anyhow. The matter seemed serious at the start, but with our system we felt that the loss of

glasses was not vital, especially as under our system the team captain could use his glass and could spot for and watch the entire team at one time. As a matter of fact, this feature of our system proved especially effective without the individual glasses, when used against teams that had no system and lost their glasses too.

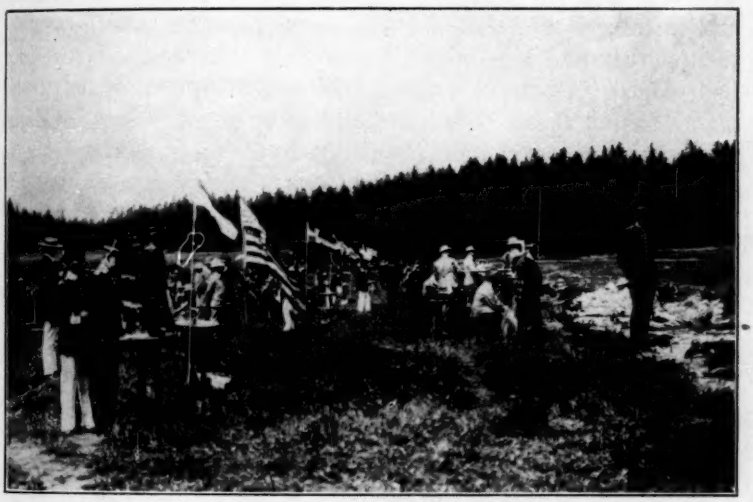
June 29 was the real opening day of the Olympic Games. The events were not held in the stadium, but were scattered around the city. In addition to the international military team rifle match, held that day, there were a pistol match, a shot-gun match, football games and tennis, each held in its special place. Matches in these branches continued for one week, after which the stadium games were started. I will cover the rifle matches in the order they were fired.

THE INTERNATIONAL.

This was perhaps the most important military rifle match ever held, as ten of the leading military countries of the world were represented. The day was fair, and at the longer ranges the wind was strong enough to test in full the knowledge and ability of the contestants. The range presented a brilliant spectacle. From flagpoles erected at different parts of the range floated many Swedish ensigns; behind each team, on a short staff, was the national flag of the team; gaily uniformed officers from various countries moved up and down the line watching the match; while, intermingling with all, were the many Swedish army officers who, with their aides and orderlies, were conducting the match. The contestants themselves added not a little to the brilliancy, for as a rule each team had its own special shooting uniform. Our own khaki was perhaps the least striking and most serviceable. The most striking were the Russians, in green knickerbocker and Norfolk jacket suits, topped with green Alpine hats from which a long green feather stuck out rakishly from the side. The South Africans were conspicuous in a light yellow khaki; the Norwegians wore yellow duck; the Swedes appeared in olive drab; the British and French teams wore any old thing. Among the spectators were generals, noblemen, and even the Crown Prince of Sweden. As the *Finland* did not arrive until the next day we were without a following of our own.

The opening stage, 200 meters, started with our team the favorite, for our practice had been carefully watched and the remarkable way our team sized up the conditions and poured in bull's-eyes had been noted. But many thought that the Swedes, who had

been months in training, or the Britishers, who were undoubtedly Great Britain's best shots, might lead us. These wise ones acknowledged the superiority of our military sights, but could see no other good in the Springfield rifle, with its very short barrel and sight radius. It was generally conceded that our team was far ahead of any of the others in its discipline and system. But what the final outcome would be was not long in doubt, for at the first range our team made a total of 438 points out of a possible 450, ten points more than the second best team could do. We had not expected to lead at the short range by such a long margin, if at all. We knew that no team could lead us there by more than



THE FIRING LINE AT THE 400-METER STAGE.

a point or two, and had therefore devoted our energies to perfecting our system at the longer ranges, where we knew the greatest gains could be made. When we led so easily at the doubtful stage, we were no longer worried about the final outcome. The standing of the teams at the 200-meter range was:

1. United States 438
2. Great Britain 428
3. Sweden 417
4. South Africa 415
5. Norway 408
6. France 405

Greece, Denmark, Russia, and Hungary were trailing far behind.

Immediately after the completion of the firing at 200 meters, the targets were changed, the teams dropped back to 400 meters, and the second stage started. At this stage our team demonstrated its remarkable shooting ability, for while the other teams were getting many fours and threes, our team, out of the 102 shots fired, put all but four in the bull's-eye. After making bulls on all of their twelve sighting shots, our men fired 48 record shots before one went out of the bull, a truly remarkable performance. Of the four shots that did not hit the bull, two were fours and two were threes; so the total of the team was 444, only six points less than the possible. Sweden, the next best team at this range, made 28 less than we did, and Great Britain 34 less. After this remarkable shooting by our team our winning was assured, and the match then settled into a fight for second and third places. Sweden had gained six points on Great Britain and were then only five points behind them. France, with 407 to 387 for South Africa and 378 for Norway, went from sixth to fourth place.

Our splendid shots, working under a system that made use of every bit of information, were in a class by themselves. Briggs, of the army, and Osburn of the navy, firing on the same target, each made possibles and were respectively only three points and two points short of the possible for the two ranges. Ommundsen, of England, credited with being Great Britain's best shot, also made a possible at 400 meters and, as he had been only one point short of the possible at 200 meters, made his individual score at the two ranges the highest in the match. On our team Adams and Sprout were each one point behind him, Osburn two points, Burdette and Briggs three points, and Jackson five points. The British, with a team shooting as individuals, were confident that Ommundsen would make high individual score, and were taking solace in that, though they knew they could not win the match. The standing of the first six countries after the second stage (400 meters) was:

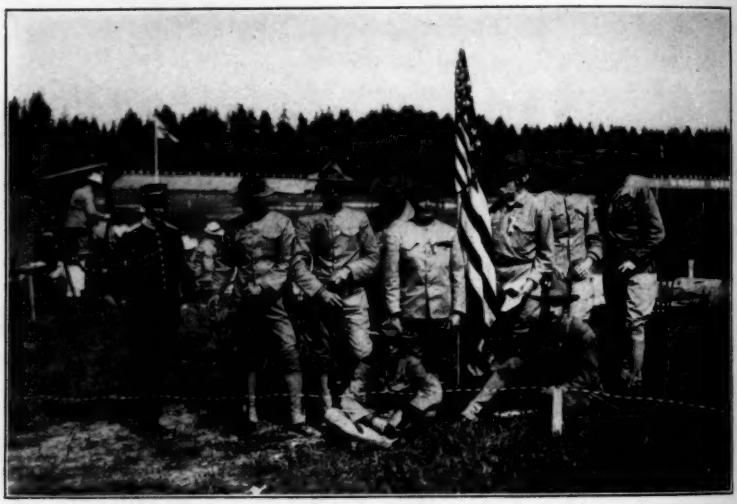
Standing	Nation	200 meters	400 meters	Total
1.	United States	438	444	882
2.	Great Britain	428	410	838
3.	Sweden	417	416	833
4.	France	405	407	812
5.	South Africa	415	387	802
6.	Norway	408	378	786

After the 400-meter stage a rest was taken for luncheon, and at 3.30 the 500-meter stage was started. There had been no wind during the forenoon, but after luncheon it was very much in evidence and brought out all the skill of the firers. Watching the wind closely and firing very rapidly when we had wind that was to our liking, we were able to finish firing at 500 meters long before any other team, and at the same time to increase our big lead. In fact it was at this range that we made our greatest gain, for while we rolled up 424 points out of the possible 450, the best the next team (South Africa) could do was 393, or 31 points less than our own score. By doing this and leading France at the range by 16 points, South Africa came up to fourth place. Great Britain, shooting 391 to Sweden's 384, increased her lead to 12 points and felt fairly sure of second place. Ommundsen for England shot high score for his team, but as it was only 69 out of the possible 75, he was passed by Briggs, Osburn, and Adams, tied with Burdette, and led Sprout by one point and Jackson by five. The standing and scores for the first six teams at the end of the 500-meter stage were as follows:

Standing	Nation	200 meters	400 meters	500 meters	Total
1.	United States.....	438	444	424	1306
2.	Great Britain.....	428	410	391	1229
3.	Sweden	417	416	384	1217
4.	South Africa.....	415	387	397	1199
5.	France	405	407	377	1189
6.	Norway	408	378	358	1144

The 500-meter stage was finished at about 5.00 p. m., and we at once dropped back to 600 meters. At this stage we found the most trying conditions of the day. The wind, which before had been light, now came stronger and in puffs that went up and down and across the range in eddies, first blowing one way and then the other. Although still five hours before sunset, the sun was low and, being directly behind the firers, threw a dazzling light on the targets. Worn by the hard shooting they had previously done, with eyes that were already strained to the limit, our men found a great deal of trouble. It was then that we longed for heavier bullets. On the drop back the British team shifted to a bullet that weighed, I am told, 220 grains. Ours weighed but 150 grains; and while the English were paying little or no attention to the wind, we found it necessary to change for every shot,

the shifts being as much as one point, going from ½ left to ½ right and back again. When each man on the two teams had fired his first block of five shots, we found the British team had gained five points on us. Our team then redoubled its energies, and in the next block of five shots per man gained two points. In the third and last block, however, we gained 11 points and finished the range eight points to the good. Our total for the range was 381, Great Britain's 373, and Sweden's 353, giving us a total lead on Great Britain of 85 points and on Sweden of 117 points. There were no changes in the standing of any of the teams at this range. Had we fired a 180-grain bullet at the 600-meter range, I am confi-



THE UNITED STATES MILITARY RIFLE TEAM
IMMEDIATELY AFTER WINNING THE INTERNATIONAL MATCH.

dent our score would have been 30 or more points higher, for practically all of our shots that went for threes would have been bulls with the heavier bullet. Having such a light bullet made our work a great deal harder, yet firing the lightest bullet of any team and still making the highest score was only further proof of the remarkable ability of our team.

At this stage Ommundsen made only 58, which made him tie with Sprout for sixth place in individual standing in the match, all the other members of our team being ahead of him. While I do not consider individual scores as having any meaning in a

team match, the English still do, and for that reason I have dwelt on the individual scores to more clearly emphasize the increased efficiency by team work.

The individual scores made by the United States team were as follows:

	200 meters	400 meters	500 meters	600 meters	Total
Capt. A. L. Briggs	72	75	70	66	283
Lieut. C. T. Osburn	73	75	72	58	278
Sergt. H. L. Adams	74	74	73	62	283
Capt. C. L. Burdette	74	73	71	70	288
Hos. St'd W. A. Sprout	74	74	69	59	276
Sergt. J. E. Jackson	71	73	69	66	279
Totals	438	444	424	381	1687

The final standing and scores of all the teams were as follows:

Standing	Nation	200 meters	400 meters	500 meters	600 meters	Total score	Points per man
1	United States	438	444	424	381	1687	281.1
2	Great Britain	428	410	391	373	1602	267.0
3	Sweden	417	416	384	353	1570	261.7
4	South Africa	415	387	393	336	1531	255.2
5	France	405	407	377	326	1515	252.3
6	Norway	408	378	358	329	1473	245.5
7	Greece*	...	...	...	...	1445	240.8
8	Denmark*	...	...	...	...	1419	236.5
9	Russia*	...	...	...	...	1403	233.8
10	Hungary*	...	...	...	...	1333	222.3

*Scores by ranges not published.

THE INDIVIDUAL MILITARY MATCHES.

As already stated, we had at all times neglected to train for any except the big team match; but having won that, our men were keen to go on and clean up in the individual matches. There were two of these matches known respectively as the "300-meter match" and the "600-meter match." The first of these was a type of rapid-fire match with which we were entirely unfamiliar. In it each contestant fired 20 shots, 10 at what is called "the stationary target" and 10 at the "half-figure." The first is a ring target in the center of which is a silhouette of a prone figure. The second is a silhouette of a kneeling figure similar to our skirmish target. Each group of ten shots is fired in three minutes,

the contestant at the start being at the position of "Order arms" with the piece unloaded and chamber open. At the first command "Eld" ("Fire") the contestant loads and fires at the "stationary target." The first four shots are fired from the prone position, the second four from the kneeling position, and the last two off-shoulder. Targets are then shifted and the half-figure silhouette put up, and, at the second command "Eld" the piece is loaded and ten shots are fired at the half-figure in three minutes. In this second string five shots are fired from the prone position and five from the kneeling. On the half-figure a hit counts 5, all other shots count zero. This appears to be an easy match, and if time had been allowed for training, many of our team would have made possibles. As it was, they did very well, though in the little training we had in Annapolis we made a serious mistake on the half-figure. The half-figure is printed on a large sheet of paper and has a pink background. Samples of these targets had been sent to us and we pasted them on a frame and shot at them. The black figure surrounded by pink made a weird-looking target, but imagine our surprise to find, when we got to Stockholm, that the pink part was cut off, leaving only a half-figure silhouette which sat on top of a dark earth bank and had more of the same dark earth behind it. It was too late to remedy our mistake, so we went into the match without having had any training at that target.

The match was held in the morning, the sky being overcast and the day dark, with some but not much wind. Our team, unpractised as it was, was, however, better than most, for the men were cool and methodical and made the best of things. Their average score was easily the highest of any nation. But even at that we were not what we thought good.

Out of the possible 100 points the high score 97 was made by A. Prokoff, a Hungarian. The next highest score was 95, and three contestants tied with that—Osburn of the United States, Skogen of Norway, and Lerides of Greece. As all three had made a possible at the half-figure, the tie had to be shot off. Of Osburn's 20 shots all had been bulls except one, and that was a bad pull off-shoulder at the stationary target, on which he drew a miss. It went just out of the 1 ring at two o'clock. Just before the tie was shot off, the other contestants suggested that the points be divided, but knowing Osburn's ability we declined. Osburn fully justified

us, for while the Greek blew up completely and made but 46, and Skogen got off with 91, Osburn came through with 99, only one point short of a possible, and *beat the winning score by two points.* There were 91 contestants in this match, representing twelve countries. The final standing of the first four was as follows:

1. A. Prokoff, Hungary.....97
2. C. T. Osburn, United States 95
3. E. E. Skogen, Norway 95
4. M. N. Lerides, Greece 95

After luncheon we went back to 600 meters for the individual military match. The conditions of this match were five sighters and 20 shots for record. At the beginning of the match the weather was very threatening. Dark clouds gathered and the wind rose. There were 85 contestants, representing twelve countries, and as all could not fire at the same time, they were divided into relays. Those on the first relay had much the most difficult conditions of the day, and under these conditions Captain Briggs made 93 out of the possible 100, a remarkable performance, and six points more than were made by any other man in that relay. When the second relay came on, the conditions were improving rapidly, as the average scores showed, and there were two 94's and a 93 knocked out. I am of the opinion that the masterful shooting of Captain Briggs in this match proved him to be the man who should have won it, for when he fired the conditions were against him by the value of about six points. The difficult wind conditions again made us realize that we should have had a 180-grain bullet for the longer ranges, for while Captain Briggs was making changes of a full point for wind between shots, men from other countries firing heavy bullets rarely got out at all for wind. The scores of the first four men were:

1. P. R. Colas, France 94
   C. T. Osburn, U. S. 94
3. A. L. Briggs, U. S. 93
   J. E. Jackson, U. S. 93

The ties for both first and third places required a shoot-off to decide the final standing, and the shoot-off was held three days later. We were unfortunate in having the shoot-off come immediately after a small-bore match in which Osburn was firing, for he went to the shoot-off after having been shooting under a hard strain all day. The day was dark and the wind puffy. Colas

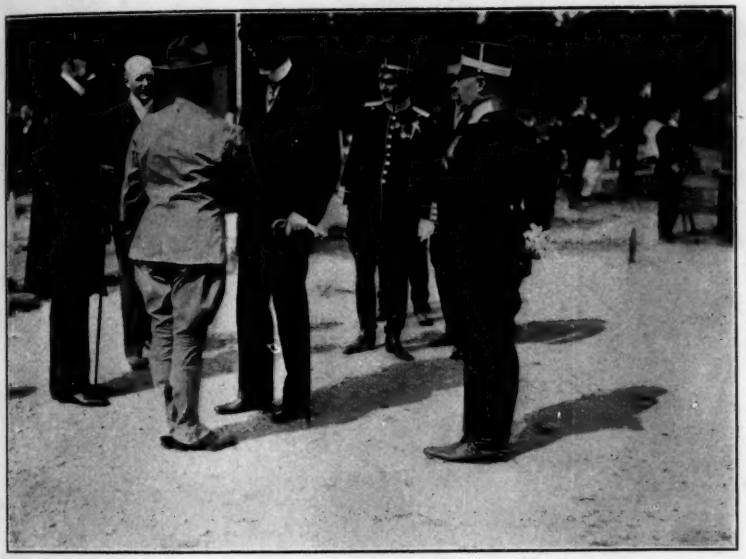
and Osburn, on adjacent targets, were fighting to determine the first and second places, while Briggs and Jackson fought out their fight for the third place near by. Osburn and Colas went at it nip and tuck. Colas, firing a heavy bullet, had no wind changes to make, and with him it was merely a question of holding. Osburn had to change for wind on every shot. In spite of the handicap, Osburn led most of the way, only to be evened up on the 19th shot. Then came the 20th shots. Colas got his off first and it was a bull. Osburn took his time, made a careful study of the wind and at last let the shot go. We all hoped and prayed for a bull, which would again tie the score; but the shot, though perfect for wind, was a four just out at twelve o'clock. Colas' score was 91 and Osburn's 90. There is no doubt that Colas is a wonderful shot and he deserved his laurel wreath, for there are but few shots in the world who can equal him at slow fire at long ranges and I feel that none can excel him. His was a popular victory. While Colas and Osburn were having their fight, Jackson and Briggs were working hard, first one and then the other leading. At the end, however, Jackson had 90 to Briggs' 89 and took the bronze medal.

This finished the military matches. We had won first in the team match, second in the rapid-fire match, and second and third in the 600-meter match. Our possible number of points, had we won all the places, would have been fifteen. In the Olympic Games a first in any kind of an event counts three points, a second two points, and a third one point; and had we won first, second, and third in both individual events, on top of first in the team match, we would have had the fifteen points. However, competing against all the rest of the world, we took eight of the possible fifteen points. England had two points, Sweden one, Hungary three, and France three. We at least took our fair share, took a place in all the events, and took four of the seven medals it was possible for any one country to win. We were considered by all to have made a wonderful record, and our success was taken special notice of by the King of Sweden, who made a trip to the range just to see the work of our team.

In these military matches the work of Lieut. C. T. Osburn, of the navy, was remarkable. He not only did his work well in the team match, but in the individual matches he was especially brilliant. His taking second place in the rapid-fire match was most creditable, but when in the shoot-off of the tie in that match he

made a score that *beat the winning score* by two points, he proved to the world his remarkable ability and steadiness. When, on top of that, in the same day, handicapped by having to fire a bullet far lighter than he should have had, he tied for first place in the long-range slow-fire match, he proved his right to the title of the best all-around military marksman in the world.

An analysis of the scores made in the military matches shows that both in the individual matches and in the team matches the United States team was in a class by itself. In the team match,



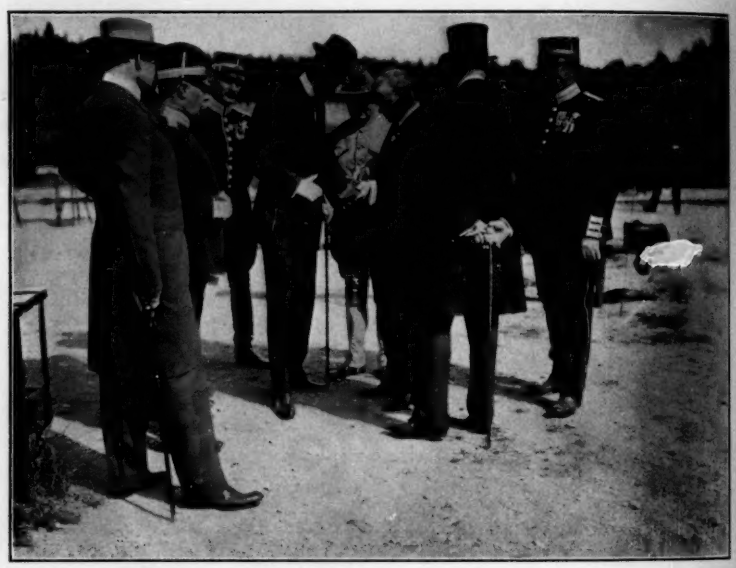
THE KING OF SWEDEN CONGRATULATING THE TEAM CAPTAINS ON WINNING THE MATCH.

out of a possible 300 points per man, the average points per man for our team ranged from 13 to 59 points more than the average points per man of our opponents. Only one man from any other nation equaled the score of any one of our men in the team match, and that man only tied with our lowest score. Not one other individual was within ten points of our lowest score. As this very great difference in individual scores was not apparent in the individual matches, I feel that our team system of shooting, in which we were far ahead of any other nation, was responsible for it. To the British team our shooting was a big surprise, for though

they knew that we were very good they had no idea that we had advanced so far ahead of them. One of the members of their team, writing for one of the London papers, said: "In shooting, the Americans were a revelation and a law unto themselves, and their organization must be seen to be appreciated."

THE ANY-RIFLE MATCHES.

On Tuesday, July 2, the individual any-rifle match was held. At the last minute we were in some doubt as to whether or not



COL. J. J. DOOLEY EXPLAINING THE SPRINGFIELD RIFLE, USED BY THE U. S. TEAM, TO THE KING OF SWEDEN.

we should enter this match, for when we saw what kind of a match it was we knew that it was a waste of time for us, without proper equipment, to attempt it. But we were very anxious to compare the shooting efficiency of our military weapon with the perfect target weapons so highly developed by the European gun-makers, and so went in. In this match each man fired 120 shots from a distance of 300 meters, at a target one meter in diameter divided into ten concentric zones, valued from 1 to 10. Forty shots were fired standing, 40 kneeling, and 40 prone. Only open sights were allowed.

The rifles used by the Europeans in this match were of high power; they had very long barrels, were fitted with special grips for the hands, were perfectly balanced, and were equipped with hair-triggers. They could not be used for any other than target purposes. Consider putting a military rifle built only for war purposes, and with a trigger-pull of four pounds, against rifles of that kind. It had never been done before, and our competitors were amazed to see what we were attempting to do.

The day was anything but good for shooting. A drizzling rain was falling and the fresh wind was very raw. Our men had hardly fired a shot off-shoulder in three weeks, and our light rifles, which have a heavy recoil and were difficult to hold steady in the fresh wind, gave our men a mighty hard day's work. The lead the Europeans made when firing off-shoulder was more than we could overcome, for they were also a little better than we when shooting kneeling, and, though we easily beat them from the prone position, we could not gain enough to make up our previous losses and the best we could make was fifteenth place, taken by Osburn in a field of 82 contestants. Our men as a rule were above the average of the other contestants, an excellent showing when one considers that we had about as much chance in this match as a man would have of winning a tennis tournament using a base-ball bat instead of a tennis racquet.

It might be well to state here that a program of the rifle matches had been sent to us some months before the games, and that in accordance with it we had arranged our teams and entered all the matches. But *after* we arrived in Stockholm we found that the program had been changed, and that whereas, in the original program, there had been only one match going on at a time, in the new one the any-rifle team match, the individual 50-meter miniature match, and the running-deer team match were all to be held at the same time. As they were held on widely separated ranges, it was clearly impossible for our team to shoot in all. We could shoot either in the any-rifle team match or in both the individual 50-meter match and the running-deer team match, so we gave up the any-rifle team match, as the results of the individual match showed us that while we could easily beat five of the opposing countries, there were three that would almost certainly beat us. We had a better chance in the other two matches, and therefore chose them. As we took first place in one and second in the other, our decision was wise.

THE MINIATURE MATCHES.

The miniature matches began on Tuesday, July 2, with the 50-meter team match. This was open to teams of four men from each nation, 40 shots per man. Any breech-loading rifle of caliber not exceeding 6 mm., and having an initial velocity of not more than 1476 feet, could be used. No telescopic or magnifying sights could be used. Any position *without artificial rest* was allowed.

While we were practically without training for this match, we still had hopes of winning it with our Stevens .22-caliber rifles. We found, however, that though we had an excellent rifle, we were outclassed on sights, for in comparison with the sights of our opponents, which had vernier adjustments both ways, our sights, which required a screw driver to move them, were really pitiful.

There were two rulings in this match that surprised every contestant except those from Sweden. The first was that after having had our telescopes taken from us when shooting at ranges from 200 to 600 meters, we were informed that at 50 meters we could use them. The other was the executive officer's ruling as to what constituted "artificial rest" forbidden by the rules. His ruling was that since the earth is not artificial, you may use it as a rest in any way you want to. I am sorry to say that the only team that knew of this remarkable and previously unheard-of ruling was the Swedish team, and they took advantage of it in this way: The firing mounds had a considerable slope to the rear. By digging a small hole in the ground in which the toe of the rifle was placed, the firer could, by resting his rifle barrel on the front edge of the mound or on his left arm extended on the ground, get a holding position that was about as steady as a machine rest. It was so clearly against every known precedent of rifle shooting that no other team would use it and all protested strongly against it. Nevertheless it was allowed.

The match started. It became quickly apparent that Great Britain's splendid team, with their perfect rifles, was the best in the field. The fight for second place was between the Swedes and ourselves; but their "machine rest" style of holding overcame our much greater shooting ability, and they finally beat us out by four points out of the possible 800.

The standing and scores of the teams were as follows:

1. Great Britain 762
2. Sweden 748
3. United States 744
4. France 714
5. Denmark 708
6. Greece 708

The individual 50-meter miniature match was held on the Fourth of July. As W. A. Sprout, of the navy, had in the team match tied with W. E. Pimm, of England, for first individual honors, our men felt that we had some chance of winning despite our inferior arms. In this they were right, for though the match was remarkably close, Captain F. S. Hird, firing against 41 opponents, succeeded in getting a lead of one point in the early stages, which lead he maintained to the end, finishing with the remarkable score of 194 out of a possible 200. The scores of the first three men were as follows:

1. F. S. Hird, United States 194
2. W. Milne, Great Britain 193
3. H. Burt, Great Britain 192

On the following day the 25-meter miniature matches were held, the individual match being held in the morning and the team match in the afternoon. The conditions of these two matches were the same except that in the team match the four individual scores were added together. The targets used in these two matches were silhouettes of a man 4.7 inches high. This tiny figure was divided into ten zones, which, in case the number of hits on the figures of two contestants were a tie, would be counted to determine the score. These zones had a value of from 1 to 10, the 10 zone being a patch considerably smaller than a dime. Each competitor fired 25 shots in five series of five shots each. The little figure would appear 25 times, each time for three seconds, with an interval of five seconds between appearances. At the end of each series of five shots the target was renewed.

It will be seen that, with a bobbing target of this kind which always comes up in the same place, the peculiar method of holding used by the Swedes was a tremendous advantage, for as they used automatic rifles it was only necessary to lay the gun correctly the first time and pull the trigger on subsequent shots. With this tremendous advantage they naturally took the first three places, although the Englishmen were right on their heels.

After the individual match the firing stopped for the luncheon hour, during which our team discussed the advisability of adopting the Swedes' method of holding. We still felt that it should not have been allowed, but it was suicidal for us not to use it. So, in the short time between matches, our team practiced that method of holding, and in the team match in the afternoon used it.

Attention should here be called to the fact that though we were using .22-caliber automatic rifles in these "bobber" matches, as were other countries, they had a big advantage over us by having a rear sight with a vernier adjustment both laterally and vertically, while our rear sight could be moved only in the vertical plane. To compensate lateral errors our men had to take a hammer on the firing line and tap the front sight over. As the hammer was in continual use it afforded much amusement to the other contestants —and some amazement too, when they noted the work our men did with such crude material—for the fact that we were given third place in this match, instead of first place, hinged on the decision of the executive officer as to the value of one of our shots.

During the early stages of the match both the British and Swedish teams missed the little figure on one shot. This gave each team 99 hits out of the 100 shots fired. The United States had fired 95 shots and had made them all hits. In the last string of five shots our last man fired a shot that just grazed the figure. Under the written rules of this match the *edge* of the shot hole was to determine the value of the shot. As the shot had clearly touched the black we claimed a hit, which would have made all our shots hits and given us the match with a perfect score. But the executive officer ruled that though the shot had touched the black it had not *cut* it, and that it was therefore a miss. We felt our claim was particularly good, for at the point where the bullet hit there was a slight notch in the edge of the figure, where one of the white-zone rings became tangent to the edge. Had the edge been smooth, the shot would have been a good hit. But the executive officer was firm and scored us but 99 hits, which made us tie in hits with both Great Britain and Sweden. Thus the score had to be determined by counting the zones, and as the more accurate sights of both the other countries had enabled them to bunch their shots much better, they both beat us. Sweden of course got first place, while Great Britain took second, and the United States third, the official score being as follows:

1. Sweden 925
2. Great Britain 917
3. United States 881

I wish to say that in making the decision as to whether or not the shot in question was a hit, the executive officer ruled as he had done in several other instances, and we therefore have no fault to find with him. I have dwelt on the point more with the idea of showing the wonderful adaptability of our riflemen, for not only were they engaged in a new game with inferior equipment, but at the last minute they changed their entire style of shooting and still shot so well as to make their winning or losing dependent on a ruling of that kind. The men firing on our team were Sprout and McDonnel, of the navy, and Hird and Leushner, of the national guard.

THE RUNNING-DEER MATCHES.

During the time that the other rifle matches were being held on the ranges to the eastward of the city, the running-deer matches were being held at Rasunda, to the northward. During the two days of preliminary shooting, the running-deer team had made an effort to get some practice, for it must be remembered that (excepting Winans) they had never even seen a running-deer target or range. It was essential that they should see what they had to do. But they got but scant practice, for there was but one running-deer target and there were many contestants wanting practice. Our men found, too, that while we had what is considered a very good sporting rifle, it was in many ways inferior to the arm especially designed for the game and with which all the other contestants were equipped. More than that, our men were meeting in this match the best running-deer shots of Europe, men who are highly trained and specialized in the game.

In the running-deer match the target consists of a silhouette of a running deer in natural size. This deer is made to run from cover to cover (23 meters) in about four seconds. The contestant in any position (usually sitting) and at a firing point one hundred meters from the deer's run, has his rifle at the ready. After the deer appears he must aim and fire before it disappears. In some matches they fire single shots and in others double shots. The deer is divided into spaces of different values and a hit has a value depending on its location. To get a five requires a hit

through the heart, and other values down to one represent hits in less vital spots; hits in the head, legs, or hind quarters count zero. It will be seen that this match is devised particularly for sportsmen, and that by all precedents a novice would have no chance. Our men did not get a place in either the individual single-shot match or the individual double-shot match; but in the team match, where the *average* shooting counts, they took second place by a good margin and against teams of experts. Sweden took first place and Finland third. I know of nothing that points out better than this match the all-around shooting ability of our military riflemen. The men who fired on this team were Mr. Winans, Colonel Libbey, Passed Asst. Surgeon McDonnel, and Sergeant Leushner.

The shooting features, which had been going on for a week, were completed on July 5. Our rifle team, originally made up to win the international team match, had not only made the three points for first place in that match, but had, by trying everything, gained places in *seven* of the ten other rifle events, and made a total of 15 points for the United States. The pistol team, during the same time, took eleven points, and the shot-gun team six, so that at the end of the first week the United States had 32 points to her credit, all of which were gained in shooting. This put the United States in the lead in points gained, which position she maintained until the team left Sweden.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE NEW NAVY REGULATIONS.

By LIEUT.-COMMANDER NEEDHAM LEE JONES, U. S. Navy.

Beginning with the "Rules for the Regulation of the United Colonies" in 1775, twenty-five editions of regulations for the government of our navy have been issued. They became the "blue book" in 1818, but were changed to "red book" in 1832, when the "Rules of the Navy Department Regarding Civil Administration" were issued, followed in 1838 by "Financial Regulations for Naval Officers." Presumably the administration ceased to be civil and officers needed no financial regulating, for shortly thereafter the present title in slightly amended form was adopted, and has been in use ever since. The years between successive editions mark periods of stagnation, as between 1876 and 1893; or of upheaval, unrest, or progress, as indicated by three issues between 1865 and 1870.

The "U. S. Navy Regulations and Naval Instructions, 1913" were approved by the President and Secretary of the Navy on January 25, 1913, after having been under consideration and revision throughout the last three years. They replace regulations issued to enforce various schemes of naval administration that were in force prior to the present system, which was inaugurated in 1909. Since that date the present system has undergone numerous modifications, changes that inevitably result from progress, and that will continue to crop up as the navy itself advances. It was almost impossible to issue definite regulations while rounding the edges and smoothing the rough spots in the new system, but the methods of handling work ashore and afloat are so radically different from those prescribed in the 1909 blue book, that the need for the new book has become imperative.

To facilitate changes and obviate the unwieldy proportions of the old book, with its nineteen C. N. Rs. pasted in place, the new

edition is printed single-page and inserted in a loose-leaf binder. It contains an historical preface, table of changes showing the disposition of all old regulations, general, special, and navy yard orders, and the source of the new regulations and instructions. The index, almost twice as comprehensive as the old one, was done by the Government Printing Office, under the supervision of two young officers attached to battleships undergoing overhaul. One of them testified to the terrific strain of cross-reference indexing, by saying, "When I awake in the morning and see my slippers at my bedside, my brain immediately begins to reel with 'Slippers—see boots, shoes.'"

Following the index come the Navy Regulations, which have the President's approval, printed on blue paper. These are followed by the Naval Instructions, on white paper; these consist of such instructions as are usually contained in general, special, and navy yard orders, and are subject to change by the Secretary of the Navy. In the back of the binder are inserted several of the new series of general orders—special orders will no longer be printed—and these will henceforth have a syllabus printed at the top. These are placed in the binder for convenience until a separate binder can be furnished for their exclusive use.

Officers interested in the 1913 book will not have far to look before finding radical changes. The first chapter of the Regulations is given to the Articles of War; the second gives, succinctly and definitely, the new administration of the Navy Department. The assignment of the Section of Accounts of the Bureau of Supplies and Accounts and the Director of Navy Yards to the Division of Material, one week before the new edition was approved, so establishes the new administration as to have all business emanating from or referred to the Navy Department flow through one of the four channels, the Divisions of Operations, Personnel, Material, or Inspections. The only exceptions to this are the Office of Library and Naval War Records, which is under the Chief Clerk, and the Solicitor, who is the Department's legal adviser.

The Aids for Operations, Personnel, Material, and Inspections form the Secretary's Advisory Council; they meet daily to discuss broad questions of administration, organization, and policy; their decisions are made after consulting the bureaus and offices concerned, and are recorded for the information of the Secretary

and Assistant Secretary. It will be noted in this chapter that the almost-forgotten Bureau of Equipment occupies a prominent place, but a foot note explains the annual distribution of its duties, as authorized by Congress.

No attempt will be made to discuss the details of vital changes in the chapters affecting navy yard organization and administration, inspections, repairs, surveys, supplies, etc. It may be of interest, however, to mention a few of the changes that are out of the ordinary, and that might easily escape notice for months; these are set forth below in the order in which they occur.

NAVY REGULATIONS.

Chapter 3 places all ships in two classes: in commission, and out of commission. Those in commission are in one of three conditions: in full commission, in reserve, or in ordinary; reserve ships have the same status as ships in full commission, while those in ordinary are under the commandant. Receiving ships have a peculiar status, being under the senior officer present afloat with regard to their material readiness for sea, and under the commandant for receiving ship business.

Chapter 10 prohibits the use of "General Order," "Special Order," "Navy Regulation," or "Naval Instruction" by any bureau or office.

Chapter 11 has radical changes in matters of rank, command, and duty, while Chapter 12 gives more definite regulations upon honors and distinctions. Several recommendations of the Joint Army and Navy Board are incorporated in the latter: the "Admiral's March" is designated for the band in tendering honors to flag and general officers; 11 guns are given consuls-general; and in the absence of a band, "To the color" must be sounded by the buglers upon the occasion of the reception of the President.

In Chapter 15 commanders-in-chief are directed to make an unusually poor performance at target practice or in any part of the steaming competitions the subject of investigation.

The duties of the personal and fleet staff are revised in Chapter 17; the personal staff has been enlarged by the addition of a fleet radio officer and a fleet torpedo officer, and the division staff by the addition of a division naval constructor, when constructors become available.

Two new corps were added to Chapter 27, the Naval Medical Reserve Corps and Naval Dental Corps.

The regulations governing liberty for enlisted men, which were drawn up in the Atlantic Fleet, are given in Chapter 34.

NAVAL INSTRUCTIONS.

Chapter 2 was completely rewritten after having been printed, as a result of an executive order placing navy yard labor under the Civil Service rules.

The reports on fitness of officers, as given in Chapter 5, will, in the future, form the basis of assignment to duty. The use of these reports was evinced by the recent selection of the post-graduate classes, which was based exclusively upon reports on fitness. One officer selected is being returned from a foreign station because his record showed him to be a desirable officer for the course, although he had not applied for it.

The duties of chief of staff are enlarged in Chapter 9, and all the personal and fleet staff perform duties "under the chief of staff."

In Chapter 12, the chief fire control duties are taken away from the executive officer, as a result of a majority recommendation of the Atlantic Fleet. His duties in time of battle now place him near the captain, but where his station would not be involved in any disaster to the conning tower. The gunnery officer is placed in central control of the battery, in Chapter 15, while the first lieutenant is left in the central station (Chapter 13).

Chapter 29 contains a new and interesting series of instructions on the care, handling, specifications, and tests of coal, fuel oil, mineral oils, and gasoline.

As an example of the never-ceasing changes, attention is invited to Chapter 42, on accounting at navy yards. The present system, which was drawn up by accounting experts, is liable to complete revision by a conference of commandants of naval stations. Similarly, the approval of a pending proposition to abolish Title B equipage will cause changes throughout the Instructions.

Chapter 44 should inaugurate an era of conciseness, simplicity, and almost brusque directness in methods of interior correspondence. This chapter deserves immediate and careful study, since

official letters must hereafter comply with its requirements with regard to the following:

(1) File number in the upper right-hand corner, for vertical flat filing.

(2) Use of sub-letterheads, when practicable, at shore stations.

(3) Use of "From" only when sub-letterheads are not used.

(4) Use of "To" as at present.

(5) Use of "Subject," "Reference," and "Inclosures" as given.

(6) Body of letter must not contain formal, introductory, or circumlocutory phrases, or useless initials; must be brief, logical, and confined to one subject.

(7) When letterhead or sub-letterhead indicates writer, signature must be surname only for officers above the rank of lieutenant.

(8) Pages must be arranged in inverse order, first page on the bottom, last page on top.

This direct method of correspondence is, by mutual consent, used with the War Department.

In Chapter 44 will also be noted the new telegraphic and cable addresses of flag and commanding officers: as "Flag, *Wyoming*, Havana," and "Comofficer, *Maine*, Philadelphia." Telegraph and cable companies will be notified of these changes.

There are changes of interest and bits of consolation throughout the book for all grades. For instance, retired officers will be pleased to know that they may change their address or even go abroad without asking permission (I 705 (3)); a commander-in-chief must salute upon the occasion of every visit to a foreign port, instead of once a year (R 1212 (3)); captains are told that battleship crews cannot do repair work while at navy yards (I 3408 (1)); executive officers of first-rate ships never have to alternate with other heads of departments (R 3708 (1)); watch officers may stand day's duty when reduced below five for any reason, instead of merely "by reason of sickness" (I 2508 (6)); the assignment of quarters at navy yards is given in R 4511; the national flag is used at funerals instead of the union jack (R 1308); only one wine-mess is allowed a ship, to be run by an officer not below the rank of lieutenant, but junior and warrant officers may become members thereof (I 827); last, and one of the most radical, is this: officers and men shall hereafter salute

with the "off" hand * (R 1193 (5)). This was a recommendation of the Joint Board, and the only authorized exception to the use of the off hand is in rendering honors to passing vessels and to officials coming on board, when the right hand salute is prescribed in Article R 1157.

The last change in the new book was made as the pages were being printed, and was the insertion in Article R 4489 of a provision giving officers traveling between or to shore stations beyond the continental limits of the United States, or returning therefrom, a baggage allowance similar to that allowed by the army.

Enough articles have been left vacant between successive sections of each chapter to accommodate probable additions for five years. Despite careful proof-reading by all bureaus and offices, numerous errors were nipped in the final page proof, and undoubtedly numerous ones remain to be reported by the service at large. Some of the errors that clung to the end were: a statement of radio messages received from "seaweed" (seaward), and surgeons teaching the use of "sprints" (splints).

However, the book goes on its mission with the best intentions.

* AUTHOR'S NOTE.—The Joint Board on February 26, 1912, reconsidered this and recommended saluting with the right hand exclusively, when making hand salutes. This will necessitate a change in the new regulations.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

TRANSMISSION OF ORDERS DURING THE NAVAL BATTLES OF THE RUSSO-JAPANESE WAR.

Translated from the *Marine Rundschau*, of August, 1912,

By COMMANDER H. F. BRYAN, U. S. Navy.

The descriptions of the naval battles of the Russo-Japanese war are being condensed more and more into one uniform picture. Clearer and clearer has become the light shed on the apparently confused courses steered by the different groups. It is becoming more and more easy to follow the decisions of the separate leaders. The more definitely the maneuvers of the ships are known, the better we can determine how far apart were intention and result, what decisions were thwarted by failures of personnel and material.

Naturally, the victor has no interest in bringing the details too clearly to light. His evident success is enough for his fame. In order to guard his war experiences won by bloodshed, it is better not to publish needless details. Therefore, it must not be expected that the work of the Japanese Admiralty Staff, recently made accessible to the German reader, gives exact details concerning the transmission of orders and battle signals. Would that the expert could receive more accurate information on this subject from the Japanese! However, up to the present time, the impression has existed that the Japanese disposed of their fighting force exactly as if on their drill ground, in spite of the division of their fleet into many groups widely separated, and in spite of being under an occasional hot fire.

It is a very pressing question whether, in future naval battles, such perfect transmission of orders may be expected; whether the commander-in-chief of a modern fleet, in a fight against an equal, will have such sure control of his speaking apparatus, the signal system, as was apparently permitted the victor of Tsushima.

This question is of immense importance in the handling of a fleet. Battle tactics are closely connected with the battle signal system; the former is in a condition of dependence on the latter. If a signal does not immediately transmit every item of desired information to the leader, every order from him, it is an obstacle to tactics. The ideal condition is reached only when the signal system places the leader just as if he were looking down on the battle-field with a bird's-eye perspective—just as if, like a chess player, he could place his figures exactly to his own liking.

This condition was far from existing in former naval battles. The history of naval warfare gives many examples showing that battle signals may fail and be misunderstood. Sending of orders during battle was therefore always limited to an essential minimum. It was a sign of splendid leadership if no signals were necessary. General fighting instructions, together with a complete mutual understanding between, and much drilling together of, the leader and his commanders, and battle plans worked out for special cases, were always the means of making signals during battle superfluous. Trafalgar is a classic example; Nelson contented himself with one battle signal.

Not so Togo at Tsushima. A glance at a sketch of the battle teaches us that many signals must have been made.

The foundation for this difference between Trafalgar and Tsushima must be sought in the development of ship construction and of weapons. Quick change of place, the ship's course largely independent of wind and weather, numerous changes of purpose, darkening of the battle-field by smoke and powder vapor, separation of divisions, a very different use of weapons—all these, and other things, will make necessary more frequent initiative by the commander-in-chief and subordinate commanders in the battles of to-day than in the battles of one hundred years ago. If the commander-in-chief cannot to-day show his initiative by the movements of his own flagship alone, and thus make plain his purpose, he must make use of signals. Signals are then displayed as orders to ships and subordinate commanders, and as orders for simultaneous maneuvers, that is, for turns (Wendungen[1]).

In earlier times the use of signals to send orders, news and reports was reduced to the lowest possible limits. News signals

[1] AUTHOR'S NOTE.—"Wendung" is the technical expression for a simultaneous and similar change of course of several ships.

were entirely restricted to the opening of the battle. During the battle, the commander-in-chief was almost entirely restricted to his own observation. If this applies to-day, the commander-in-chief must feel the lack all the more severely, the more he himself ought to intervene in a modern naval battle.

Now, how was it actually with regard to sending orders and making reports in the Russo-Japanese naval battles?

For the transmission of orders and reports during battle, a modern fleet has available: flag signals, radio-telegraphy, and despatch vessels. The Russians and the Japanese did not make use of these methods to the same extent. This is shown partly by the published reports of battle; in part, it must be concluded from the movements of the ships. In this connection it must be borne in mind that the lack of unity of action on the part of the Russians cannot be charged with certainty to failure of signals; and that the happy unity of action on the part of the Japanese cannot be charged unconditionally to good signal communications.

The contestants entered the battle under very different conditions.

Witthöft had not had any opportunity to drill his squadrons. Apparently, also, he had issued no plan of battle up to the 10th of August. Rojestvenski had, it is true, issued general tactical instructions. They included: change to battle formation, use of ordnance, supporting disabled ships, transfer of Admiral to another ship, transfer of the command to the next in seniority, etc. During the outward voyage, opportunity was taken to have formal tactical drills for the groups so hurriedly thrown together. But the mutual understanding, which in battle must bind the commander-in-chief with his subordinates more closely than signals sent, was also lacking at Tsushima. Rojestvenski had only outlined the battle problems of the separate groups in a very general way. He had issued no battle plan, no "Memorandum."

It was otherwise with his opponent. It would have been strange if the Japanese, with their characteristics, had not assured to themselves every possible advantage in anticipation, by exercises, battle practices, issuing of orders and battle plans. Their close formation in the line drew this avowal from their opponent on August 10: "The first Japanese division was conducted as if in a peace maneuver." The distribution of the Japanese into numer-

ous tactically almost independent subordinate commands made an extensive interchange of signals absolutely necessary before the battle. They are not known in detail; but it is well known that Togo had thoroughly prepared for the battle of the Sea of Japan, and had clearly indicated to the various groups their tasks therein. As the approach of Rojestvenski became known, "all the divisions commenced their movements against the enemy, in accordance with the problems which had been assigned to the separate groups"; at the beginning of the battle, the third, fourth, fifth, and sixth divisions acted "in accordance with the previously given instructions for the battle."

Therefore a good part of the credit must, without question, be given to previous preparation, to the issuing of orders before the battle, if there existed a great superiority in unity of action of their entire force on the part of the Japanese.

With reference to the transmission of orders during the battle, it is to be regarded as an efficient performance if it is possible to transmit the necessary directions to other ships. It is a mark of higher efficiency if simultaneous tactical maneuvers can be conducted by signal without interference.

A not insignificant number of examples of the first can be named on the Japanese side. On the Russian side also, in spite of the greater destruction of signal systems, in spite of obstacles due to powder vapor and the water columns thrown up by ricochetting shells, many signals were sent and received even during advanced stages of battle. Several are mentioned: On February 9, 1904, the *Variag*, while under a heavy fire, made a flag signal to the *Korietz*, which was understood. On August 10, the *Cesarevitch*, toward the end of the battle, made a flag signal regarding the transfer of leadership to Prince Uchtomski, who received the signal aboard the *Peresviet*. On the same day, the *Askold*, under a heavy fire, signaled "More speed" and "To port," and was understood. On August 14, the *Rurik*, after being nearly three hours under a heavy fire, received the order by signal, "Proceed to Vladivostok," and sent a signal report of the injuries to her rudder. At Tsushima, Nebogatoff signalled, toward the end of the battle, "Follow me." A majority of the ships received this signal. A short time before, Nebogatoff had received an order, by despatch boat, to go to Vladivostok.

There are also examples of the failure of signals on the Russian

side. On August 10, Prince Uchtomski hoisted the flag signal on the forward bridge rail—the signal gear had been destroyed—"Follow me"; it was not received by all the ships, and was not obeyed. Nebogatoff testified that he had not received a single order from the commander-in-chief at Tsushima between 1.55 and 6.25 p. m. No wonder, as it was impossible to make a signal on the fleet flagship to call a torpedo-boat alongside; and the signal personnel had been sent below by the flag lieutenant, because the signal system could no longer be used. Evidently, the Russians had been reduced to flag signals and despatch boats, while the Japanese, in addition to these methods, still had radio-telegraphy available. The reserved Japanese report does not make it clear whether an order was given by radio-telegraphy or by flag signal. Nothing is said about a notorious failure of signals; on the contrary, many orders by signal are mentioned which were made while under a heavy fire, and at the end of a long battle. Among these are the following: On February 9, 1904, the third Japanese division received, off Port Arthur, the order, while under the enemy's fire: "Get out of range." On May 27, 1905, the *Mikasa,* firing herself and also under fire, signalled to the fifth and sixth divisions, which were apparently keeping far away: "Attack the rear ships of the enemy." On the evening of the battle (7.20 p. m.), the commander-in-chief sent an order to attack to all destroyers and torpedo-boats, to which, partly to prevent misunderstandings, a cruiser was attached. At the same time, all ships received orders by radiogram, about discontinuing the battle, about the course and rendezvous. Radio-communication was no longer considered quite certain by the Japanese on the evening of the battle; the *Tatsuta,* the repeating ship of the first division, was sent, in addition, as a despatch vessel to confirm the radio-messages to the different groups. The Japanese main headquarters received a report of the result of the battle by radiogram on the same evening.

These examples show conclusively that both sides succeeded in sending more than once, even while under fire and during the later stages of the battle, short orders by signal to ships and groups; failures in such attempts at signalling are known only on the Russian side.

It would have been a very good exhibition of efficiency in signalling, had groups of ships been able to execute turns smoothly while under fire.

Turns by the Russians during battle can readily be passed over, as there was only one such attempt made, on April 13 by Makaroff. Neither side was then under a heavy fire, and apparently the formation in the turn and line of bearing executed by the Russians was not completed.

On the Japanese side, numerous turns were made during battle. The following, taken from published accounts, are worthy of notice: On February 9, 1904, the third Japanese division, as already mentioned, received the order from Togo: "Get out of range." The division seemed to be in danger of having the Russian fire concentrated on it. The division, composed of four ships, immediately went ships right eight points, and avoided the enemy. On April 13, 1904, the third division made another turn, this time under a heavy fire. On August 10, the first Japanese division, six ships, turned about sixteen points, near the beginning of the battle. The ranges were large. No serious injuries had yet been sustained. On the same day, toward the end of the battle, after several Japanese ships had been seriously and several slightly damaged, the first division made a four-point turn, and, apparently firing, proceeded in a four-point line of bearing. At Tsushima, Japanese groups made numerous turns. The third division, four ships, turned about four points at 5 p. m., while apparently under a heavy fire. The division proceeded in a four-point line of bearing and got out of range. The first division, six ships, made six turns of about eight points each, three of them being from line. Only one of them was made under a moderate fire on both sides (2.58 p. m.). During another turn (4.35 p. m.), firing was practically almost at an end. All the others were made while neither side was firing. In addition, the first division always had at hand a completely intact repeating ship.

These examples of turns during battle are a proof of good Japanese training in maintaining battle formation and in signalling. They do not, however, serve as a conclusive proof of efficiency in signalling. *Never did more than six ships turn together; never did they make a turn after they had all suffered severely; never at a time when they were hard pressed by the enemy and were themselves locked fast to him.*

The Japanese were far from being in the ideal position for a leader, mentioned above; that is, like a chess player able to place

his pieces after looking over the battle-field. After their overwhelming success, one was inclined, at first glance, to assume that their fighting strength, in spite of its separation into small groups, had cooperated continuously as a unit during the battle. One wanted even to deduce therefrom that separation into small groups and surrounding the enemy on all sides would be the tactics of the future.

This conclusion can hardly be supported by a close observation of transmission of orders during battle by the Japanese and the cooperation of groups. This closer observation will find no fault with the brilliant efficiency of the Japanese. But it is a fact that no complete unity reigned even in the separate groups. The distribution of targets is made known to us in the principal battles. The target was changed very often; on February 9, and August 10, 1904, almost all of the large Russian ships were under fire from almost all of the Japanese ships. The lines of fire generally run apparently without rule, and cross each other. Had the leader been in a position to establish uniformity in fire distribution, he would surely have done so. But he himself was not at any time in a position to see clearly how the enemy appeared to the separate ships; and the signal system would not have sufficed to distribute the fire of the groups uniformly.

With reference to the cooperation of the separate groups, it is worth remarking that, both off Shantung Promontory and at Tsushima, the separate divisions did not by any means enter the battle at the same time; indeed, hours passed before they were in position. The battle at Tsushima was already almost decided between the battleships and armored cruisers before the first Japanese small cruisers got within range of the Russian small cruisers and tenders. The Japanese third and fourth divisions opened fire at 2.50 p. m., the sixth division at 4.45 p. m. and the fifth division hardly any sooner. It could not have been the intention of the commander-in-chief to have the fifth and sixth divisions get within range of the enemy so late. They had arrived on the battle-field at the right time, so that they cannot be reproached with a lack of the joy of battle. Their course until about 2.00 p. m. indicates that they understood the battle attack quite differently from what it actually became, due to Togo's evolution when firing began. Shortly after 2.00 p. m., they were ordered by the commander-in-chief to attack the enemy's rear

ships; but, apparently, they were left to look out for themselves after that, and took 2½ more hours to get within range of the enemy.

That does not point to continuous signal communication, to continuous uniformity of conduct of the battle from one position. For such leadership opportune reports of the state of the battle from the different positions would have been requisite. Not even one such report by radiogram has been made known. If, in spite of this, a great degree of cooperation on the part of the Japanese is to be noted, it was apparently not due to the transmission of orders by signal, but to personal observation, to personal decisions of subordinates, to the old English maxim—"mutual support."

As the first and second Japanese divisions, at Tsushima, at about 5 p. m., headed to the southward, in search of the Russian main body, which had withdrawn out of sight, the latter had gotten into a fight with the Japanese small cruisers, and was threatening them seriously. No report of this fact reached the first and second divisions. It was the sound of gun-firing in the direction of the smoke-covered main body of the enemy that induced Admiral Kamimura to separate his second division from the first and to hurry to the help of the small cruisers. Nor did the first division, now left alone, and out of sight of the hostile main body, receive any report from Kamimura about the movements of the enemy. Togo, apparently more by good luck than anything else, turned again to the northward at 5.30 p. m., when he also found the enemy. These selected examples of failure to report can be taken as sufficient to show that even their efficiency in signalling did not permit the Japanese to interchange this most important information during battle.

Japanese successes in signalling, which seem great at a first glance, must be brought back to their right measure. If decisions for the future are to be drawn from these successes— a short examination may be permitted here—it must be remembered that, assuming the same means of signalling, the effect of shrapnel and common shell against unprotected signal apparatus will have increased in the meantime. Therefore, a warning is needed against a too optimistic regard for the signal apparatus during battle. Of course, there will be moments of slackening of fire on both sides during future naval battles. During such moments, it will be possible to send and receive short orders by signal.

Even turns, with small groups of ships, can then be made. However, one must guard himself against believing in the ability to make useful reports during battle because of the performance of the Japanese, and must avoid building up tactics of detached subdivisions widely separated from each other from a basis of signal communication under fire.

If it comes to pass that the leader in a modern naval battle is forced to adopt greater initiative than in earlier naval battles, and if the described uncertainty of battle-signalling continues to exist, then the outlook for the leader is not very cheerful. The case can very readily be imagined that a line, finding itself in a hard-pressed position, might want to perform an evolution which would lend another direction to the battle and favor its purposes. If the means of signalling forbid this maneuver, the signal system becomes an obstacle to tactics, instead of advancing with technics and instead of giving it a new impulse.

But ought not the power of modern technics find a means of signalling capable of defying the enemy's fire? This may seem improbable at present, and be reserved for the dim future; but when it comes, what then? Would not the present questionable movements while under a heavy fire be thereby made possible? Most certainly. Further, would not a very extensive and most important transmission of information and orders during battle result, and leadership shape itself anew from the very foundation?

It is a question, whether the leader in a naval battle should not place himself, like the general in war on land, in the background, on a flagship, to which would pour reports from all sides; where, free from one-sided impressions, uninfluenced by the picture of destruction which would present itself to him under certain circumstances if he were aboard a ship in the line, he could get a clear idea of the state of the battle on all sides. From here, he could give his orders, after calmly weighing them.

The question of a centralized leadership from such a retired position is not new. But, up to the present time, just as soon as the idea is presented, it is condemned with earnest proofs. Its realization, with the present means of signalling, is not to be thought of, after the lessons of the Russo-Japanese War. Whether it will not be realized later, if signalling is ever perfected in the way referred to, naturally cannot be predicted with certainty. Yet, even in this case, one must not expect too much from the transmission of orders in battle.

Even when it comes to pass that very many reports can be sent to the central station on the flagship and orders can be issued in all directions, the naval leader will never have the control of affairs as completely in his hands as the general in land warfare, located in rear of the battle-field. Indeed, it is hardly possible to speak of a "background"; in a naval battle, the "background" may become the "foreground" very quickly. On the water the battle picture shifts much more quickly than on land, for a strictly centralized conduct of affairs. Reports about the state of the battle afloat can only with difficulty be made as brief as necessary. Generally a fixed point is lacking for the designation of place. A maneuver of the enemy often demands an instant reply. Seconds are costly. The counter-maneuver, therefore, even when it is of decisive importance, cannot be ordered by a superior in the rear.

Therefore, it will always remain true that the leader in a naval battle will virtually have to depend on his own observations. He will, in spite of all the disturbances which would result from a position in the fighting line, so choose his position that he will hold the immediate control of affairs in his own hands at the decisive point. There, it will be possible for him, assuming improved signal communications, to get reports from the separate fighting detachments, and to send instructions to them. A rigid control is not to be thought of. The personal observations and the personal decisions of subordinate commanders will always assure the best tactical cooperation. Kamimura's "courir au canon" cannot always be done; the subordinate groups must keep each other in sight as much as possible.

Such a procedure, on the ground of a sound distrust in the value of signal communications in a naval battle, will also be the best eventually to bring about improved methods of signalling.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

STEAM TURBINES.

By LIEUTENANT B. A. STRAIT, U. S. Navy.

It is the aim of this article to present to the service an elementary treatment of the principles of the so-called impulse and reaction turbines, and in a later article the aim will be to point out the manner in which these principles are applied to marine turbines and turbine auxiliaries in use to-day, especially in our navy. No claim is made to originality in the manner of treatment. The paper is merely a presentation, in condensed form, of data and explanations found in Southern, Moyer, Cox, Stadola, Kent, Thomas and others.

The laws of steam state that the greater the range between the initial and final pressures of steam, in its expansion, the greater will be the work obtained from a given amount of steam; and that the rapidity of the flow of steam from a point of any pressure to a point of lower pressure is increased materially because of the property of expansion possessed by steam. Throughout the study of the principles of the turbine it will be found that it is this rush of steam from which all the work is obtained. The power of doing work which rushing steam possesses is known as its *kinetic energy*, the amount of which depends directly upon the square of the velocity of the steam.

REQUIREMENTS OF A TURBINE.

The practical steam turbine, to be efficient, must be designed so that it will accomplish the following:

1. Transform the available heat energy into the maximum kinetic energy.

2. Absorb from the available kinetic energy the maximum power.

3. Rotate at a speed that will be economical and safe.

4. Combine simplicity of construction with reliability of action.

CLASSIFICATIONS OF TURBINES.

All practical steam turbines are grouped into two general classes, known commercially as either *impulse* or *reaction;* but these terms are confusing, because of the fact that at least one turbine in use at present is operated by *both* impulse *and* reaction, several by impulse alone, but none by reaction alone. These terms will be retained to avoid further confusion, but will not be considered as literal terms descriptive of the principles involved.

The impulse turbine is sometimes known as the *velocity* turbine, and the reaction as the *action-reaction* or *pressure* turbine.

Simple and commonplace examples of the two types of turbines are found in the windmill, where the *impulse* of the wind upon the vanes causes rotation; and in the pin-wheel, where the *reaction* of the continual explosions of the powder acting tangentially causes rotation.

Professor Thomas gives one of the best definitions of impulse and reaction:

> *Impulse* is the total dynamic pressure exerted by the steam or jet passing over a blade or bucket surface and experiencing a change in direction of flow. *Reaction* is to be understood as the pressure opposite in direction to that of flow resulting from and accompanying a change in velocity of the steam.

With the simple impulse turbine it is known (and will be proved later) that for maximum efficiency the circumferential or peripheral velocity of the rotor should be one-half the velocity of the rushing steam. Efficient expansion of steam from a pressure of 170 pounds absolute to 2 pounds absolute gives a velocity to the steam of above 4000 feet per second. It is therefore evident that some means must be adopted to utilize the energy by steps, rather than in one single expansion, if the turbine be intended for marine propulsion. The manner in which this is done will be shown later for each type of turbine.

THE SINGLE-STAGE IMPULSE TURBINE.

The DeLaval turbine is not used for marine propulsion, but it is described here, as far as the action of the steam is concerned, for the reason that it is the best example of the impulse turbine, in its simplest form.

Simply stated, the steam is constrained by a nozzle to impinge upon buckets arranged radially upon the periphery of the wheel attached to the shaft of rotation.

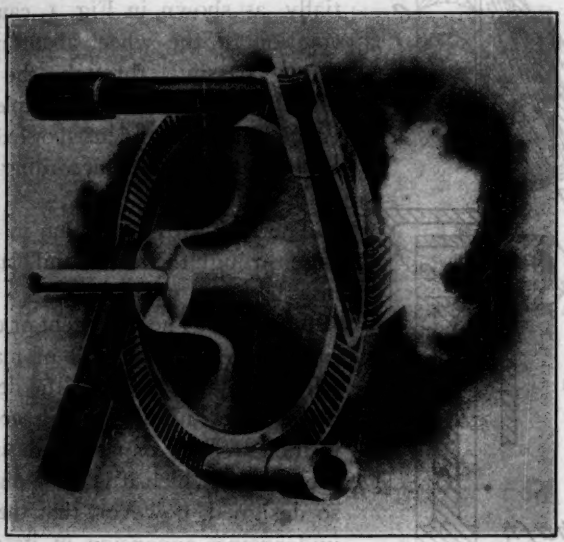


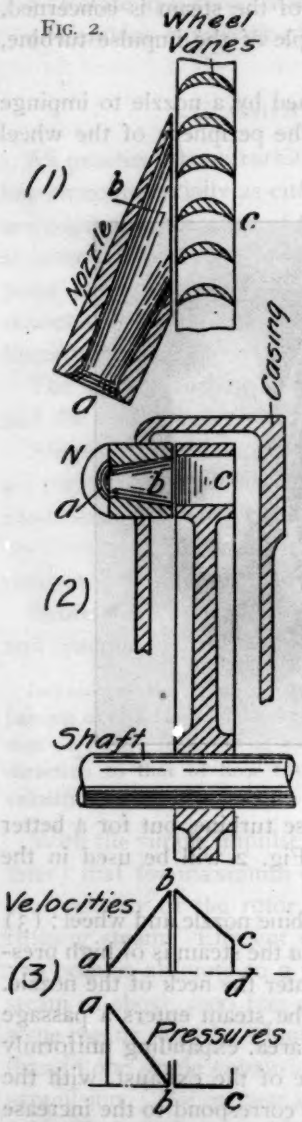
FIG. 1.

Fig. 1 shows this single-stage impulse turbine, but for a better understanding of the internal action Fig. 2 will be used in the description.

(1) and (2) are two views of the turbine nozzle and wheel; (3) is a velocity and pressure diagram. At *a* the steam is of high pressure and low velocity and is about to enter the neck of the nozzle. After passing the neck of the nozzle the steam enters a passage of gradually increasing cross-sectional area, expanding uniformly to the limit established by the pressure of the exhaust, with the result that the velocity has increased to correspond to the increase of volume, and, if no losses have occurred, the heat energy originally possessed by the steam has now been transformed to kinetic

energy in the form of steam rushing along the axis of the nozzle as shown at (1) *b*. While pursuing this line of direction the steam impinges upon the cupped blades upon the periphery of the moving wheel, exerting upon them an *impulse* due to change in direction of the jet in conforming to the curvature of the blade.

FIG. 2.



This energy being applied tangentially, as shown in Fig. 1, causes the rotation of the wheel about its axis. After passing through the single wheel, the steam has completed its function and is condensed or exhausted to the atmosphere, according to the installation.

The action of the steam in its passage through the nozzle and blades will now be taken up in detail.

Nozzles.—The divergent or expanding nozzle is the result of many experiments and varies in the degree of divergence and the length according to the extent of expansion desired and the uses to which it is to be put. It is so designed, however, that the steam, undergoing expansion in its passage through the nozzle, will acquire a velocity as the result of a constantly increasing acceleration, and that, while building up the velocity, the losses from friction, heat losses, current eddies, etc., will be reduced to a minimum.

Neglecting all losses, the velocity attained by the expansion of steam can be determined by the formula:

$$V^2 = 2gh,$$

where V is the theoretical velocity in feet per second; $g = 32.2$ (gravitational constant); and h = heat drop, in foot-pounds, *i. e.*,

total heat of initial steam minus total heat of exhaust steam (as found from the steam tables) multiplied by 778, the ratio of a foot-pound to a British Thermal Unit.

With a known velocity and a known angle of the nozzle with the plane of the turbine wheel, Fig. 3 shows a theoretical velocity diagram. V is the absolute velocity and AB the absolute direction of the jet of steam issuing from the nozzle, and α is the angle it makes with the plane of the moving wheel DB.

u is the velocity and CB the direction of rotation of the turbine wheel drawn to the same scale as V. Having given AB, BC, and the included angle α, by completing the triangle, V_1 represents

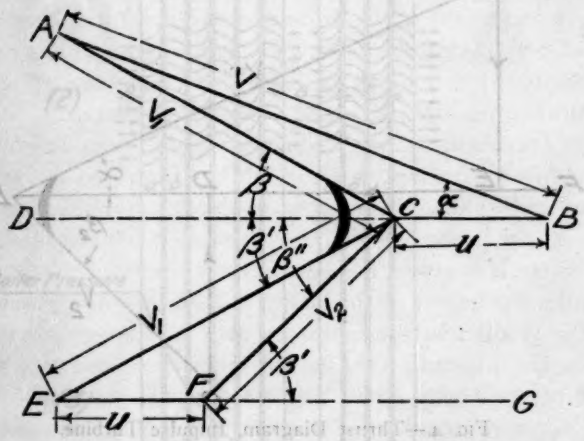


FIG. 3.—Theoretical Velocity Diagram, Impulse Turbine.

the relative velocity and AC the relative direction of the entering steam when viewed from the moving wheel.

For the sake of simplicity, the relative entering angle β and the relative exit angle β' will be assumed to be equal. As losses have been neglected, the steam will have the same relative exit velocity ($V_1 = V_1$). By laying off EF equal to u but in the opposite direction (wheel and steam are moving in opposite directions), and completing the triangle CEF, CF will represent the absolute direction and V_2 the absolute velocity of exit jet of steam. To differentiate: *Absolute* velocity is the velocity when regarded from a fixed point, and *relative* velocity is the velocity when regarded from a moving point, as in this case, the turbine wheel.

Fig. 4 shows the velocities V and V_2 as the absolute velocities of entering and exit jet of steam meeting at the blade B at angles α and β_2 respectively. By resolving these velocities into their rectangular components, EB and BD will represent the components acting together toward moving the blade in the plane of rotation FB, and AE and CD will represent the components of the impulse acting against each other (as shown by the arrows) in producing thrust to the shaft containing the blades. In the actual DeLaval turbine the blades are so designed that the components AE and CD are equal, thus counteracting the thrust com-

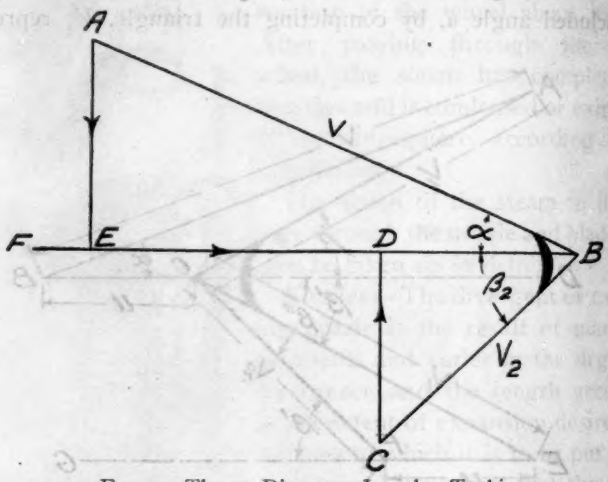


FIG. 4.—Thrust Diagram, Impulse Turbine.

ponent AE of the entering jet by the equal and opposite thrust component CD of the leaving jet.

THE REACTION TURBINE.

The Parsons turbine is an example of the impulse and reaction principles, combined with another characteristic feature, that of the gradual expansion of the steam in each of a long series of turbine elements. Contrary to the DeLaval, there are no nozzles in which the steam is expanded before acting upon the moving blades, but the first row of fixed blades acts much in the same way as the nozzles. The feature of the gradual expansion of the steam and the corresponding increase in velocity and volume necessitates a long series of moving blades to absorb the energy

with any degree of efficiency, and for each row of moving blades there is one row of fixed blades.

By this arrangement the steam velocity is always comparatively low.

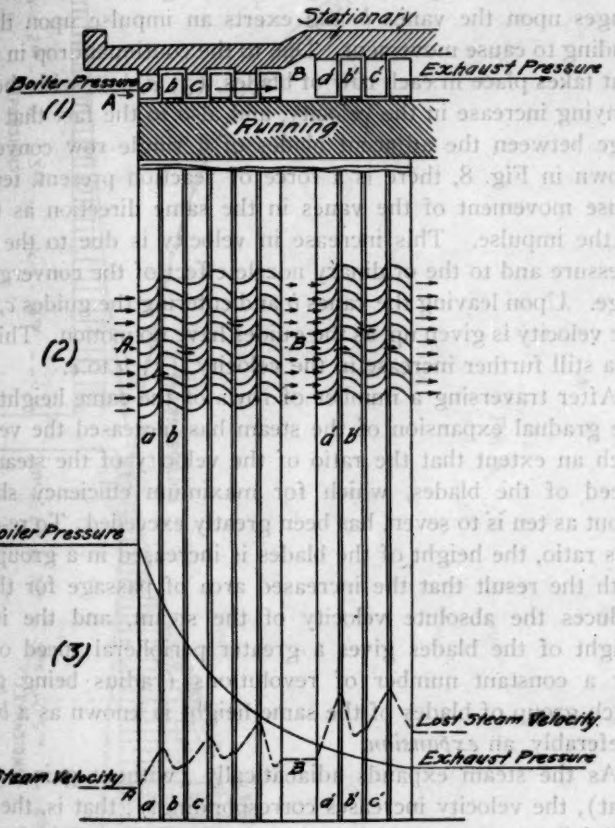


FIG. 5.—Diagrammatic Sketch of a Reaction Turbine.

The idea can be grasped more easily by following the description in Fig. 5. (1) shows an elevation in section, with alternating rows of fixed blades or guides *a* and moving blades or vanes *b*, each pair of which is known as a *stage*; (2) shows a diagrammatic sketch of the course of the steam through the blades; and (3) shows a graphic steam velocity and pressure diagram. It is necessary to follow the description in the three parts simultaneously to obtain a clear understanding of the internal operation of the Parsons turbine.

At *A* the steam is of high pressure and low velocity. Upon entering the first row of guides *a*, the velocity is increased slightly, (3) *a*, and the direction of the flow changes to conform to the blades, (2) *a*. Upon issuing from the guides *a* the steam impinges upon the vanes *b* and exerts an impulse upon the vanes tending to cause movement. Due to the continual drop in pressure that takes place in each row of blades, (3) *a*, *b*, *c*, with the accompanying increase in the velocity, and also to the fact that the passage between the adjacent blades of a single row converges, as shown in Fig. 8, there is a force of reaction present, tending to cause movement of the vanes in the same direction as that due to the impulse. This increase in velocity is due to the drop in pressure and to the oridinary nozzle effect of the converging passage. Upon leaving the vanes *b* and entering the guides *c*, none of the velocity is given up, as the guides have no motion. This results in a still further increase in the velocity, (3) *b* to *c*.

After traversing a number of rows of the same height (*A-B*), the gradual expansion of the steam has increased the velocity to such an extent that the ratio of the velocity of the steam to the speed of the blades, which for maximum efficiency should be about as ten is to seven, has been greatly exceeded. To re-establish this ratio, the height of the blades is increased in a group, (1) *B*, with the result that the increased area of passage for the steam reduces the absolute velocity of the steam, and the increased height of the blades gives a greater peripheral speed of blades for a constant number of revolutions (radius being greater). Each group of blades of the same height is known as a *barrel*, or preferably, an *expansion*.

As the steam expands adiabatically (without gain or loss of heat), the velocity increases correspondingly; that is, the velocity will follow a curve which is the reverse of the adiabatic curve of expansion. This curve gives the theoretical blade height, as shown in Fig. 6.

It is true that by the increase of blade heights by groups, there is a loss in each row of blades that does not coincide with the curve. This loss could be eliminated by having each row of blades of slightly greater height than the next preceding one, but in the opinion of the designer, the losses are not of sufficient magnitude to warrant the increased cost of construction.

The increase in the height of the blade is limited by the struc-

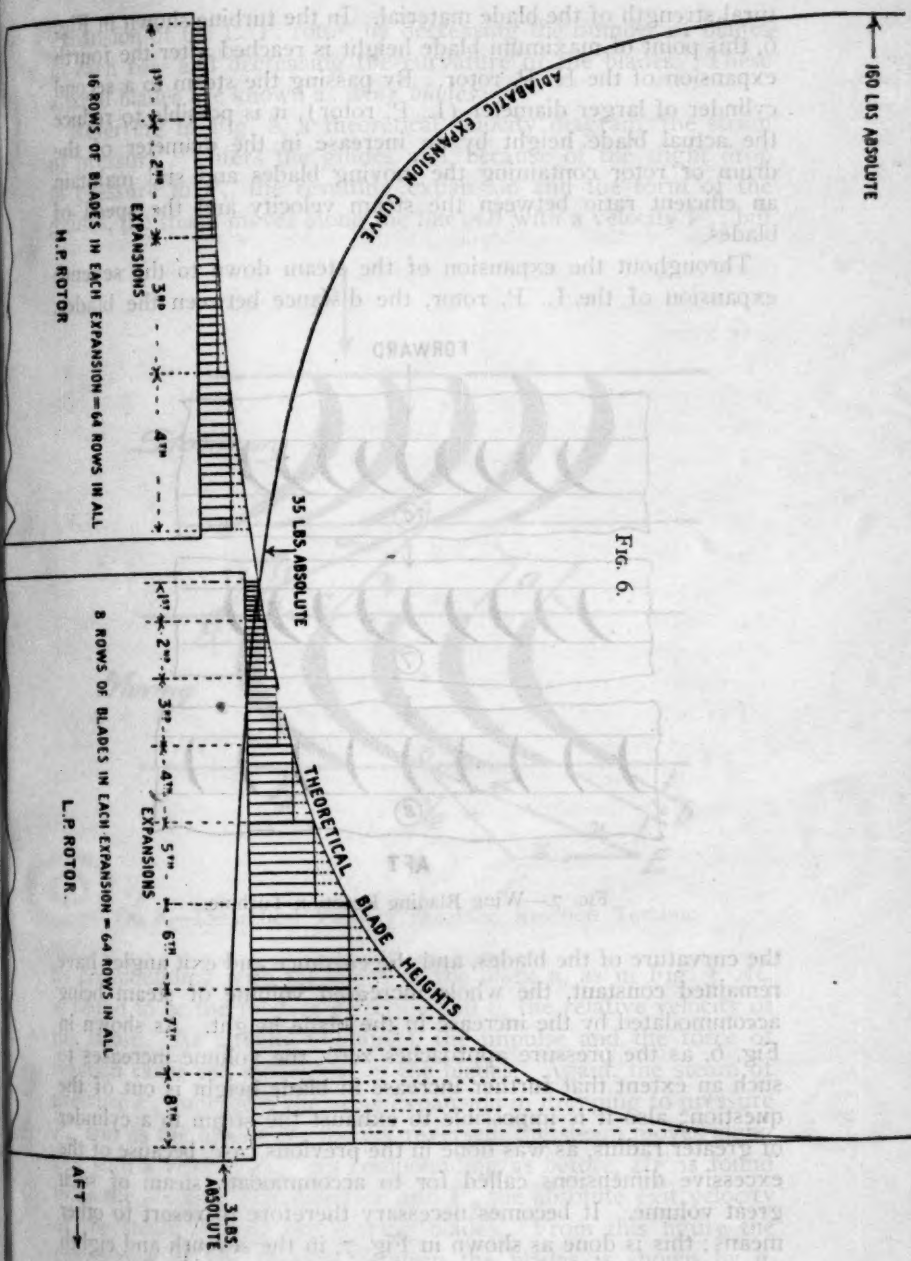

160 LBS ABSOLUTE
ADIABATIC EXPANSION CURVE
35 LBS. ABSOLUTE
16 ROWS OF BLADES IN EACH EXPANSION = 64 ROWS IN ALL
H.P. ROTOR
1ST
2ND
3RD
4TH
EXPANSIONS
8 ROWS OF BLADES IN EACH EXPANSION = 64 ROWS IN ALL
L.P. ROTOR.
1ST
2ND
3RD
4TH
5TH
6TH
7TH
8TH
EXPANSIONS
THEORETICAL BLADE HEIGHTS
3 LBS. ABSOLUTE
AFT

FIG. 6.

tural strength of the blade material. In the turbine shown in Fig. 6, this point of maximum blade height is reached after the fourth expansion of the H. P. rotor. By passing the steam to a second cylinder of larger diameter (L. P. rotor), it is possible to reduce the actual blade height by an increase in the diameter of the drum or rotor containing the moving blades and still maintain an efficient ratio between the steam velocity and the speed of blades.

Throughout the expansion of the steam down to the seventh expansion of the L. P. rotor, the distance between the blades,

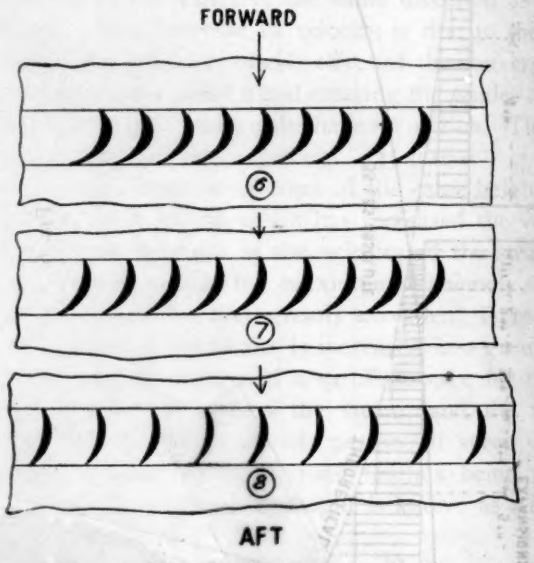


FIG. 7.—Wing Blading Reaction Turbine.

the curvature of the blades, and the entrance and exit angles have remained constant, the whole increased volume of steam being accommodated by the increase in the blade height. As shown in Fig. 6, as the pressure approaches zero, the volume increases to such an extent that further increase in blade height is out of the question; also it is impossible to exhaust the steam to a cylinder of greater radius, as was done in the previous case, because of the excessive dimensions called for to accommodate steam of such great volume. It becomes necessary therefore to resort to other means; this is done as shown in Fig. 7, in the seventh and eighth

expansion of the L. P. rotor, by decreasing the number of blades in each row and decreasing the curvature of the blades. These altered blades are known as *wing blades*.

Referring to Fig. 8, a theoretical velocity diagram, the steam of pressure P enters the guides and, because of the slight drop in pressure to P_1, the resulting expansion and the form of the guides, the steam moves along the line AB with a velocity V_1; but

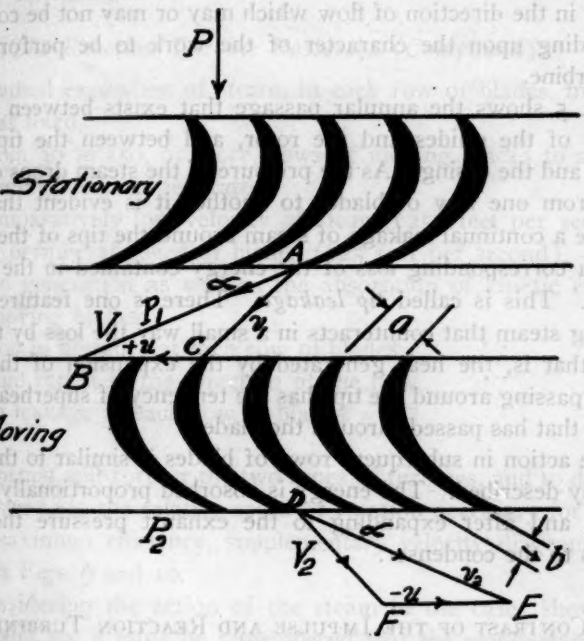


FIG. 8.—Theoretical Velocity Diagram, Reaction Turbine.

by compounding with the speed of the blade u, as in Fig. 3, AC is found to be the relative direction and v_1 the relative velocity of the steam. As already explained, the impulse and the force of reaction cause the movement of the blades. Again, the steam of pressure P_1 undergoes the same expansion in dropping to pressure P_2, and as the blades are merely reversed, the steam moves along DE with a velocity v_2. By compounding as before, DF is found to be the absolute exit direction and V_2 the absolute exit velocity of the steam leaving the moving blades. From this figure the converging of the passage between the blades is shown by a,

the width of the entering jet of steam, and b, the width of the exit jet of steam; the usual ratio is about $a=2b$ to $a=3b$.

In actual turbine practice, the expansion of the steam in the moving blades increases the velocity of flow to such an extent that, in spite of friction and other losses, the relative exit angle α and velocity DE, and the absolute entrance angle α and velocity AB, are about equal. The difference in pressure on the two sides of any row (P_1-P_2) of blades has the effect of exerting an axial thrust in the direction of flow which may or may not be corrected, depending upon the character of the work to be performed by the turbine.

Fig. 5 shows the annular passage that exists between the end or tip of the guides and the rotor, and between the tip of the vanes and the casing. As the pressure of the steam drops continually from one row of blades to another it is evident that there will be a continual leakage of steam around the tips of the blades, with a corresponding loss of the energy contained in the leaking steam. This is called *tip leakage*. There is one feature of this leaking steam that counteracts in a small way the loss by tip leakage; that is, the heat generated by the expansion of the steam while passing around the tips has the tendency of superheating the steam that has passed through the blades.

The action in subsequent rows of blades is similar to the action already described. The energy is absorbed proportionally at each stage, and after expanding to the exhaust pressure the steam passes to the condenser.

CONTRAST OF THE IMPULSE AND REACTION TURBINES.

The DeLaval and Parsons turbines have been selected to illustrate the two extreme principles involved in practical steam turbines of the present day. It is necessary that the salient features of these two be thoroughly understood, as all other practical turbines simply involve modifications of principles given heretofore.

The Impulse Turbine Possesses (Single Stage):

1. Complete expansion of steam in the nozzle from initial to final pressure.
2. Single turbine wheel to absorb kinetic energy.

3. Exceedingly high velocity of steam (3000-4000 feet per second) and high peripheral speed of moving blades (1000-1200 feet per second).

4. Simple absorption of kinetic energy in the moving blades.

5. Same steam pressure before and after passing through moving blades.

6. Absence of axial thrust.

7. No tip leakage.

The Reaction Turbine Possesses (Compound):

1. Gradual expansion of steam, in each row of blades, moving as well as fixed.

2. From 30 to 150, or more, rows of moving blades to absorb kinetic energy as it is generated.

3. Comparatively low velocity of steam (250 feet per second) and low peripheral speed of blades (125 feet per second).

4. The generation as well as the absorption of kinetic energy in the moving blades.

5. Drop in pressure at each row of blades.

6. Axial thrust in the direction of the flow.

7. Tip leakage at each row of blades.

To contrast still further the two types of turbines, and to draw a comparison as to the relative speed of rotation necessary for theoretical maximum efficiency, supplementary velocity diagrams are shown in Figs. 9 and 10.

In considering the action of the steam in the cases shown in Figs. 9 and 10, it must be remembered that the single-stage impulse turbine and the single-stage *pure* reaction turbine (no impulse) are the two types under discussion.

To review slightly, it is known that in the impulse turbine the steam expands in a separate nozzle, impinges upon the blades with a certain relative velocity, and, if losses be neglected, leaves the blades with a relative velocity equal to that of the entering jet.

Neglecting all other considerations, it is evident that to extract all the energy from the jet of steam, it should emerge from the moving blades with an absolute velocity whose component in the direction of rotation is zero. Such a case for the impulse turbine is found by constructing Fig. 9 with V the velocity of the jet,

with the rotation component DB, and u the speed of rotation taken as one-half of DB, or $u = \frac{V}{2} \cos \alpha$. By compounding the velocities V and u and the angle α, V_1 is the relative entering velocity. Being a symmetrical blade $\beta = \beta_1$, V_2 shows the relative exit velocity, and CE the relative exit direction, of the steam. By

Theoretical Velocity Diagram.
Impulse - where
$u = \frac{V}{2} \cos \alpha$.

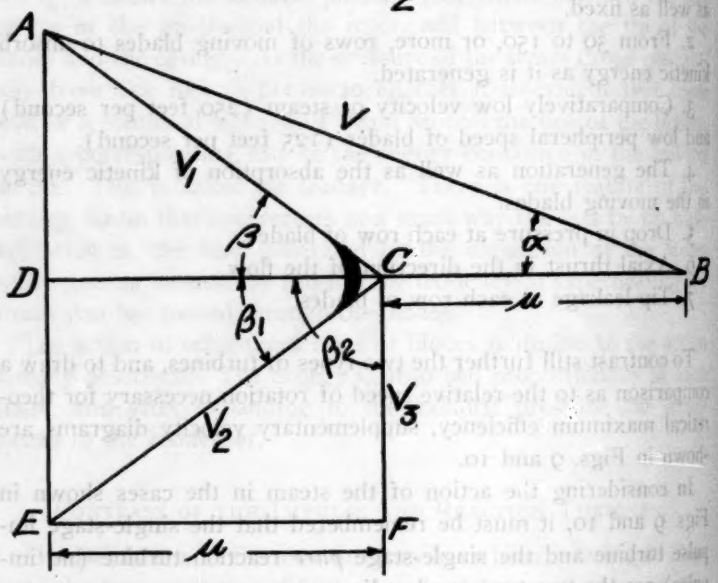


FIG. 9.

further compounding with u, V_3 is found to be the absolute exit velocity and direction; and by a review of the construction of the figure, it is evident that V_3 has a zero component in the direction of rotation. Therefore the full energy of the jet of steam has been extracted by having the speed of rotation equal to one-half of the rotation component DB of the velocity V, or $u = \frac{V}{2} \cos \alpha$.

The fact that the rotation component DB does not equal V, the velocity, but $V \cos \alpha$, is necessitated by the mechanical reason that

for the steam to flow in an axial direction it is necessary for the steam to be introduced on one side of the blade, as in this case at the angle α, and the blades must be so shaped that the steam will discharge on the other side. But to illustrate a theoretical case: as α is decreased, β and β_1 decrease in a certain ratio, until, at the point where $\alpha=0$, AB (V) coincides with DB $(V \cos \alpha)$, $(\cos 0^\circ = 1$; therefore $V = V \cos \alpha = 2u$. Also, with α approaching zero, AD and DE approach zero, thus reducing V_3 to zero.

In contrast to the impulse turbine, take the theoretical case of

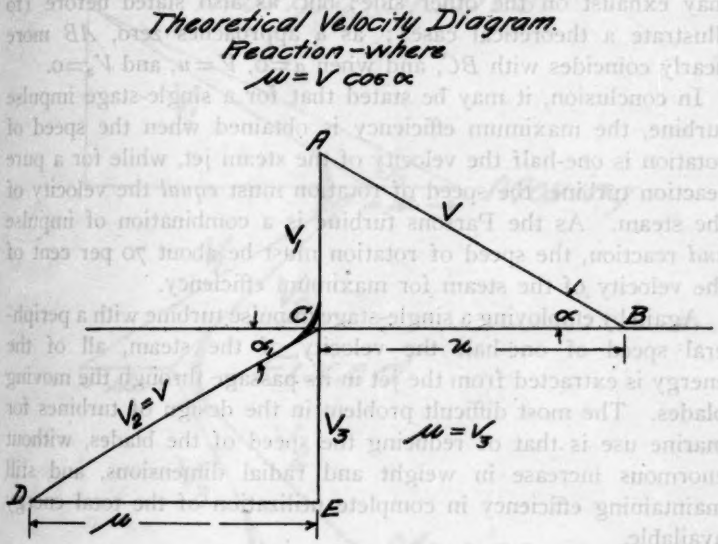


FIG. 10.

the pure reaction turbine, where the steam of comparatively low velocity enters the vanes of the moving wheel and, while traversing the passage, imparts to itself a velocity, by expansion, which exerts upon the vanes a force of reaction.

As was the case in the impulse turbine, to extract the full energy from the steam jet, it must leave the vanes with a velocity whose component in the direction of rotation equals zero. For the determination of such a case, construct Fig. 10 so that u (speed of rotation) $= V \cos \alpha$ (rotation component of V). Then, by compounding the two velocities and the angle α, V_1 is found to be the relative entering velocity and direction. By expansion through blades of same curvature $(\alpha = \alpha_1)$, the relative exit

velocity V_2 equals V. By again compounding with u, V_3 is found to be the absolute exit velocity. As before, by reviewing the construction of the figure, V_3 is seen to have a rotation component equal to zero. Therefore all the energy has been extracted by employing a speed of rotation equal to the rotation component of the velocity of the steam jet, or $u = V \cos \alpha$.

For the same reasons as stated in the case of the impulse turbine, it is necessary to introduce the steam on one side of the blade and to have blades of such a construction that the steam may exhaust on the other side; but, as also stated before (to illustrate a theoretical case): as α approaches zero, AB more nearly coincides with BC, and when $\alpha = 0$, $V = u$, and $V_3 = 0$.

In conclusion, it may be stated that for a single-stage impulse turbine, the maximum efficiency is obtained when the speed of rotation is one-half the velocity of the steam jet, while for a pure reaction turbine, the speed of rotation must *equal* the velocity of the steam. As the Parsons turbine is a combination of impulse *and* reaction, the speed of rotation must be about 70 per cent of the velocity of the steam for maximum efficiency.

Again by employing a single-stage impulse turbine with a peripheral speed of one-half the velocity of the steam, all of the energy is extracted from the jet in its passage through the moving blades. The most difficult problem in the design of turbines for marine use is that of reducing the speed of the blades, without enormous increase in weight and radial dimensions, and still maintaining efficiency in complete utilization of the total energy available.

This restriction is necessitated by the difficulty experienced in obtaining a propeller which will fulfill the requirements of efficient propulsion while rotating at a speed which will allow efficient operation of the turbines.

It will be remembered, from the proofs of Figs. 9 and 10, that for equally efficient operation, the single-stage impulse-reaction turbine must rotate at about 40 per cent greater speed than the single-stage impulse turbine, for an equal steam expansion.

The Parsons turbine, as already described, does keep a more or less constant ratio of steam velocity to the peripheral speed of the blade, by the very gradual expansion of the steam and the increase of blade height and rotor diameters; but for the impulse turbine the problem is dealt with by compounding, that is, by the compound impulse turbine.

Before embarking upon the description of the compound impulse turbine, it must be understood that if, in the single-stage impulse turbine, the steam velocity is reduced by twice the velocity of the wheel for maximum efficiency (Fig. 9), it is obvious from a study of Fig. 11 that if *two* rows of moving blades, with an

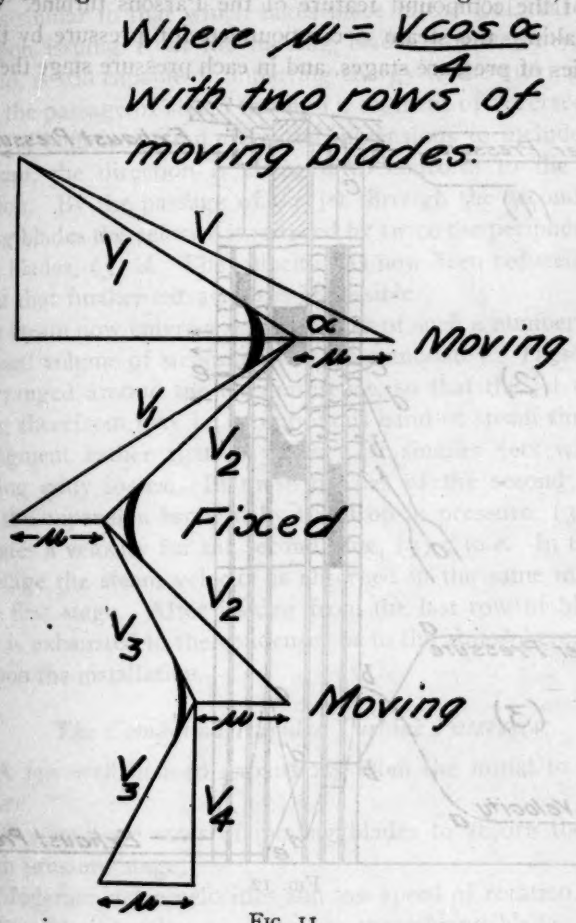


FIG. 11.

intervening row of fixed blades, be arranged in series, the blade speed need be but one-fourth the steam velocity for all the energy to be absorbed. This compounding for the absorption of all the energy contained in the jet of steam of the same pressure is known as *compounding for velocity*, each row of moving blades being called a *velocity stage*.

COMPOUND IMPULSE TURBINE.

A simple example of the compound impulse turbine will be described to show the principle of operation. This turbine combines the impulse feature of the DeLaval turbine, with a modification of the compound feature of the Parsons turbine. Generally speaking, the steam is compounded for pressure by the use of a series of pressure stages, and in each pressure stage the steam

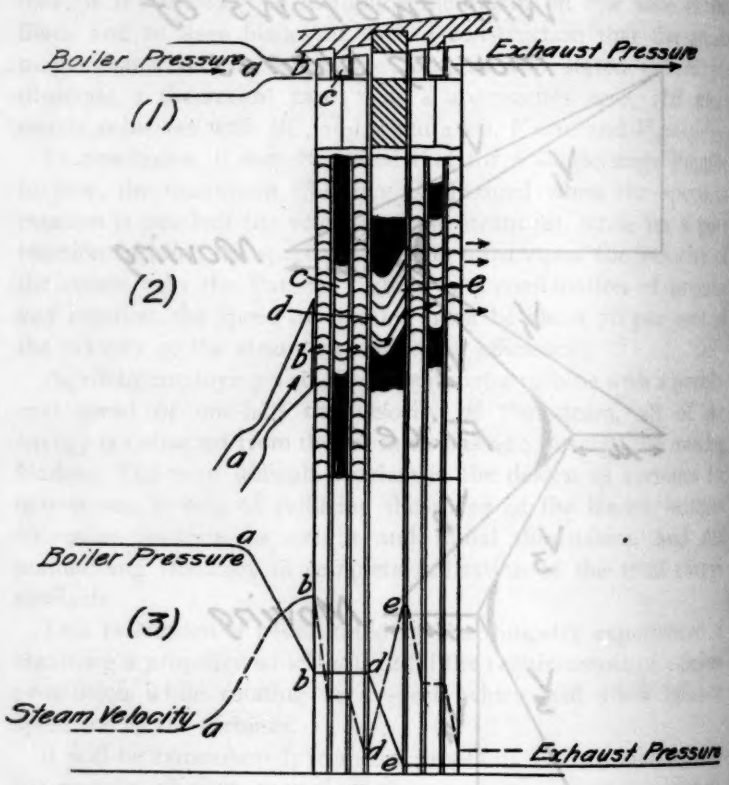


FIG. 12.

is again compounded for velocity by the use of a number of rows of blades. Stated simply, the steam is compounded for both pressure and velocity.

Fig. 12 shows a two-stage impulse turbine: (1) is a sectional view through the nozzles and blades; (2) is a diagrammatic sketch of the nozzles and blades; and (3) is a pressure and velocity line diagram.

The steam at *a* is of high pressure and low velocity, (3) *a*. By expansion through the nozzle, the steam velocity increases, (3) *b*, to the extent allowed by the drop in pressure, (3) *a* to *b;* and upon issuing from the nozzle, the jet of steam impinges upon the blades that come within the limits of that jet. The impulse of the steam here is similar to that which takes place in the DeLaval turbine; but upon issuing from the moving blades, the velocity, though reduced, is still capable of imparting energy to the moving blades; so, by the passage of steam through a segment of reversed blades, (2) *c*, of sufficient circumferential dimensions to include the jet of steam, the direction is changed to conform to the original direction. By the passage of the jet through the second row of moving blades the velocity is reduced by twice the peripheral speed of the blades, (3) *d*. The velocity has now been reduced to such a point that further extraction is impossible.

The steam now enters a set of nozzles of such a number that the increased volume of steam may be accommodated. These nozzles are arranged around the circumference, so that the jet of steam issuing therefrom may be a continuous band of steam throughout the segment rather than a number of smaller jets with their resulting eddy losses. In these nozzles of the second pressure stage the expansion brought by the drop in pressure, (3) *d* to *e*, generates a velocity for the second time, (3) *d* to *e*. In this pressure stage the steam velocity is absorbed in the same manner as in the first stage. After issuing from the last row of blades the steam is exhausted to the condenser or to the atmosphere, depending upon the installation.

The Compound Impulse Turbine Possesses:

1. A few well defined expansions from the initial to the final pressure.
2. Two or more rows of moving blades to absorb the energy in each pressure stage.
3. Moderate steam velocities and low speed of rotation.
4. Simple absorption of energy in the moving blades.
5. Same steam pressure throughout the whole of any one pressure stage.
6. No axial thrust on blades.
7. No tip leakage, as the steam is of uniform pressure in each pressure stage.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE ITALIAN-TURKISH WAR.*

(CONCLUDED.)

By COMMODORE W. H. BEEHLER, U. S. Navy.

(Compiled and translated from the *Marine Rundschau*, and other sources.)

NAVAL OPERATIONS, JUNE, 1912.

During the month of June the first squadron of the Italian fleet was in the vicinity of Rhodes and the new base at Astropalia. The third division had returned to Italy during the last of May. The fourth division, which had been undergoing repairs since the end of April, had not completed that work by the middle of June. The guns of the *Garibaldi, Varese, Ferruccio* and *Carlo Alberto* were replaced by new guns, as they had fired 2000 projectiles from the older guns. The four auxiliary cruisers likewise exchanged their old guns for new guns.

The Italian torpedo vessels disquieted the east coast of the Aegean Sea. They repeatedly entered the Gulf of Smyrna and the Gulf of Xeros, northwest of the entrance to the Dardanelles. without opposition. Their appearance caused a panic among the inhabitants of the coast and a concentration of the Turkish coast-defence forces. Considerable excitement was caused by the operations of the Italian torpedo boats in the Bay of Scalanova, south of the Gulf of Smyrna, where in pursuing Turkish merchant vessels the Italians bombarded coast towns.

An attack on Smyrna and the occupation of the Island of Chios was threatened, and the Italian press clamored for some decisive blow to make Turkey yield. This demand was inexpedient, as several of the European powers intimated objections to any further acquisition of islands in the Grecian Archipelago and desired to prevent the closing of the Dardanelles again. The Turkish government notified the powers that they would completely close

*This account of "The Italian-Turkish War," which is concluded in this issue of the PROCEEDINGS, has been published in one volume, and copies of the same may be obtained, at a cost of one dollar postpaid, by addressing the author at Annapolis, Md.

the Dardanelles if the Italians took possession of any of the large islands north of Samos.

For the defence of Smyrna and the adjacent region an infantry division was sent from Constantinople and the reserves were called out, so that in the five districts of Konia, Uschak, Aidin, Smyrna, and Denizli there were about 80,000 Turkish troops.

All Italian subjects were removed from the Island of Chios, and in view of the disposition of the Greeks on this island and the comparatively small garrison of about 1000 Turks, martial law was declared.

Thirty thousand Turkish troops were available for the land defences of the Dardanelles at Gallipoli, under the command of Risa Pasha.

The Turkish naval forces remained inactive at anchor in the Dardanelles. About the first of June the crews of these ships demanded to be led against the foe, but the ministry declined to allow the navy to attempt to engage the Italian navy.

The occupation of the 12 Turkish islands by the Italians was agreeable to the Greek inhabitants. The Italians established a sort of republican form of government in these islands. The administration of the government was largely given to the Greeks. Each of the small islands had a garrison of only about 15 Italians, with one officer, and they carefully refrained from interfering with the government, but were available in case the civilian authorities required their services. The Italians organized a system of police-militia similar to that of the Italian Carbineers. There were 400 Italian troops on the Island of Kos.

Rhodes was an exception to this administration, and had Italian officials exclusively. The central point of the administration of the group of small islands was Astropalia, which was also the Italian naval base of this region. The mail was carried to the different islands by Italian navy petty officers, and Italian postage stamps were used. The system of taxation remained as it was, but all the tax receipts were turned in to the treasury. There was no change in custom duties, except that all Italian goods were admitted free of duty, while the imports of others were subjected to duty. The Italian war-ships seldom visited the captured islands, and all was quiet during the month of June.

The forty-second regiment of infantry sailed from Genoa the last of May to reinforce the Italian garrisons on the captured islands.

The Italians raised the blockade of the Island of Rhodes, but no vessels could arrive or depart at night. In all respects martial law prevailed. Rhodes was, as stated by Sir Edward Grey in the British Parliament, occupied only temporarily (June, 1912) by Italian forces, and had not been annexed to Italy.

During June the cable between Rhodes and Canada was replaced by the steamer *Citta di Milano.*

In the Red Sea, Italian war-ships bombarded the Arabian port Havza, on May 26, and Mokka on June 3. The destroyers *Artigliere* and *Garibaldino* returned to Italy during June.

In Tripolitan waters, the *Etruria* repeatedly bombarded an Arabian camp near Benghasi, and the *Marco Polo* shelled a camp near Derna. The *Marco Polo* also led an expedition for the capture of Misratah. She sounded the channel off Buscheifa and planted buoys for the transports. Buscheifa was the last of the seven North African ports of Tripoli and Cyrenaica to be captured by the Italians, except Zuara, which still remained in the possession of the Turks. Nine transports arrived off Buscheifa on June 14. They were convoyed by the school ship division of three *Sardegnas* and six torpedo destroyers. The war-ships landed the naval brigade at Ras Zerek, and they shelled the Arabians that disputed the landing. The auxiliary cruisers *Duca di Genova, Citta di Messina,* and the *Citta di Siracusa,* with three transports, made a demonstration near Sliten, to divert the Arabians from Buscheifa.

THE BANISHMENT OF ITALIANS FROM TURKISH DOMINIONS.

The Turkish decree of banishment of all Italians from all Turkish dominions caused a bitter protest from the Italian press. The German diplomatic corps was accused of neglecting Italian interest in Turkey, of which they had assumed charge when war was declared. The protests were carried into parliament, but the minister, Giolitti, promptly stopped all consideration of the subject because of the agreement with the ministry that during the war the exigencies of the war would not be discussed by parliament, as it might aid and abet the enemy. But the charge against the German diplomatic corps in Turkey was vehemently denied.

The banishment of the Italians was accomplished without any incident, but the period was prolonged by the Turks from June 3 until June 18.

The Italian government recalled all her officials that still remained in Turkish dominions, and the home authorities were instructed to provide for the reception of all banished Italians at the expense of the government, and as soon as possible after their arrival to give them employment by the government. The king subscribed the sum of 100,000 lires for the relief of the banished Italians.

EXPENSES OF THE WAR.

The expense of the war did not require any war loans, even if the war prevailed much longer, since for many years previous to the war a surplus of 60 million lires had been accumulating annually, by economy in the budgets.

In a publication by the Naval Transportation Bureau at Naples, the expense for transportation of men and material from the beginning of the war to January 1, 1912, amounted to 13,500,000 lires, and the value of the material transported during that period was about 80 million lires. It was stated that the following movements had occurred:

In October	.....13 convoys	with a total of	50 steamers.
In November	...21 convoys	with a total of	59 steamers.
In December	....21 convoys	with a total of	43 steamers.
Total, 3 months	..55 convoys	with a total of	152 steamers.

In that period they transported a total of 101,389 men, 15,000 horses and mules, 12,000 head of cattle, 60,000 cwt. of meal, 40,000 cwt. fuel, 43,000 cwt. of hay, 30,000 cwt. of biscuit, etc.

During the middle of June the Turkish government decreed extra war taxes that raised the ground tax, income tax and industrial taxes 25 per cent. The tax for exemption from military service was raised from $233.00 to $380.00, while exemption from the reserves was raised from $150.00 to $187.00. The taxes on salt and spirits were likewise raised. A tax of 3 per cent was laid on the salaries of all officials. The war taxes levied amounted to over $10,000,000.00. The Turkish finances were in a critical condition and, in the event of a mobilization of the entire army, the Turkish treasury would be bankrupt, especially as France had refused to loan any more money until after peace should be concluded.

OPERATIONS ON LAND IN NORTH AFRICA.

During the period from May 15 to June 20 there were constant engagements at the seat of war in North Africa. May 19 a strong Italian force of five battalions, with mountain artillery and machine guns, marched towards El Atel, on the Tunisian caravan road, southwest of Sidi-Ali. They were repulsed by the Arabians and vigorously attacked by Arabian cavalry upon their retreat to Sidi-Ali. Positions remained unchanged.

The Italians started another expedition on the same route on May 31, and after meeting with some success were finally obliged to return.

June 8 the Italians at Tripoli made an attack in force to capture the Oasis of Sansur. This expedition left Tripoli at daylight and was composed of 14 battalions of infantry, one brigade of cavalry and a mountain battery, a total of about 12,000 men, under the command of General Camerana. The Turks occupied the heights at Abd-el-Gilil and the eastern border of the oasis. The Italians were supported by the guns of the Italian war-ships on the coast. The oasis is 15 kilometers (9.3 miles) west of Tripoli, and after a hard-fought engagement the Italians captured the heights and intrenched themselves there.

An attack on the left flank was repulsed by the brigade of Italians from Bu Meliana. The Italians secured their position on the heights, but the main body returned to their barracks in Tripoli that afternoon, leaving the Arabs in possession of the oasis.

The Arabs attacked the Italians at Mergheb Heights, near Lebda, but they were repulsed, with heavy losses on both sides, on May 30, June 8 and June 12. On June 12 the Italians completely routed their assailants by a clever counter attack.

The Italian army succeeded in effecting a landing at Buscheifa with a force of 10,000 men, but the town of Misratah was on June 20 still in the possession of the Arabs. There were numerous skirmishes, and the war was conducted without interruption, though the Italians did not make any material advances in the conquest of the country.

The cable from Benghasi to Syracuse was opened for business on June 10.

GENERAL.

During June and July, 1912, the bulk of the Italian fleet remained in the home ports. The armored cruiser *San-Giorgio*

joined the fleet in June, after nine months' repairs, during which she had been floated with remarkable skill.* Her commanding officer was dismissed for having run this ship upon the rocks.

The Italian press reported that, in accordance with the unanimous wish of all the great powers, Italy would in the future refrain somewhat from further operations in the Aegean Sea and devote her active hostilities more to Africa. This report seems to have been verified for the time being by the fact that the Italians did not seize any more islands during these two months.

On the Tripolitan coast the *Carlo Alberto, Iride* and *Ardea* participated in engagements at Sidi-Ali, near Zuara, while the *Etruria* cooperated with the land forces near Benghasi.

The Italians substituted the army personnel in Africa by relieving 60,000 reservists with a like number of active-service men belonging to the conscription of four years later.

During the war the government had the use of 92 chartered steamers of the merchant marine for transportation of troops and material to Africa. Among these chartered vessels two were used as hospital ships and seven served as auxiliary cruisers.

A royal decree allotted a monthly sum of $1,400,000.00 for the navy and $4,000,000.00 for the army as war expenses.

The Turkish war taxes, amounting to $10,000,000.00, were authorized by the Turkish Parliament.

Considerable discontent was expressed by officers of the Turkish army against the Young Turk administration. This took such proportions that orders were issued forbidding Turkish officers from taking any part in political questions. The troops in Albania were so discontented that a mutiny broke out, which was suppressed.

The Turks were annoyed by the hostile attitude of the population of the islands that Italy had taken and occupied in the Aegean Sea. The people on Patmos Island instructed their delegates to seek annexation to Greece or independence.

The Italians were anxious to annex at least some of these islands occupied by the Italian troops, especially Rhodes and Astropalia. The Italians claimed that in making peace these two islands should be ceded to Italy as an indemnity for the banishment of Italian subjects from Turkish dominions.

* A complete account of this operation will be found on page 768 of PROCEEDINGS No. 142.

The Italians claimed that the seizure of these islands did not violate the Berlin Treaty, since that treaty had been practically annulled in this respect by Austria's annexation of Bosnia, and furthermore these islands were seized as a result of war operations and therefore had been acquired in accordance with international law.

England desired to keep Russia and Germany out of the Mediterranean Sea, but Italy is a Mediterranean power and enjoys the most friendly relations with England. The British minister stated that Italy's friendship was prized most highly and he did not object to Italian measures to improve her strategical position in the Mediterranean.

The seizure and permanent occupation of these islands was, however, thought to increase the preponderance of the Triple Alliance, and the annexation of these islands by Italy was opposed by France.

OPERATIONS IN THE CAMPAIGN IN AFRICA IN JULY.

The Italian expedition under General Camerana that landed at Cape Zuruk, 12 kilometers east of Misratah, on June 16, was attacked by 5000 Turkish-Arabian troops on July 2 without effect. July 9 the Italians, supported by shell fire from the ships, attacked the Arabians and succeeded in capturing the town of Misratah, with 9000 inhabitants. The Italians also succeeded in clearing the fertile oasis around this town of all the hostile natives, on July 20, after a series of engagements. The Italians lost 9 killed and 121 wounded in these engagements and in the campaign to capture Mišratah.

On the Tunisian frontier at Bu Kamez, the Italians had a number of serious engagements with the Arabs. The Italian position on the peninsula there was at one time very precarious and was relieved by the cooperation of the navy. During these battles, which were fought for a period of two weeks, the Italians finally succeeded in capturing Sidi-Ali by storming the Turkish-Arabian intrenchments. In these battles the Italians gained a great moral success by the consequent security of their position on the Tunisian frontier, which had been the goal of the Italian commanders in the western part of Tripoli since Tripoli was occupied. In these battles the Italians lost 18 killed, including two officers, and 114 wounded. The Turks lost 158 killed and 200 wounded.

In Cyrenaica there were minor skirmishes and engagements with the outposts but no serious operations.

The Turkish forces captured a quantity of telephone material from the Italians, which they used in their own operations to advantage.

During the relief of the reservists of different classes during the summer, the officers were granted leaves of absence alternately to visit their homes in Italy.

The war caused anxiety in diplomatic circles and the entangling nature of conflicting interests presented some knotty problems. The principles of neutrality tend to make both belligerents antagonize all neutrals. The temptation to violate the obligations of neutrality, coupled with sympathy for one belligerent, nearly caused a conflict between France and Italy when the Turks managed to smuggle contraband of war through the French Tunisian territory. The friendship of England was manifested by a strict observance of neutrality on the Egyptian frontier, in striking contrast to the open smuggling through Tunis.

Germany was anxious to preserve her influence with Turkey, because of her commercial interests in Asia Minor and Syria, with special interests in the Bagdad railroad and other enterprises. The Germans had great influence with the Turks, and Germany was the most favored nation. This position conflicted with the interests of Austria and Italy in the Triple Alliance. Russia protested against the blockade of the Dardanelles by Turkey, which caused serious losses to her Black Sea commerce. The Kaiser and the Czar had a meeting in July, which was followed by a visit of the President of the French republic—to cooperate, it is said, in reference to Russia's protest against the blockade of the Dardanelles. The results of these two conferences with the Czar are not known, but the Franco-Russian alliance is reported to have been strengthened, and the French and Russian navies were allied for future events in the Mediterranean and the Black Sea.

England and Germany were also more involved by the war through conflicting interests, and agitators in both England and Germany stirred up a bitter feeling in the press. England concentrated her fleet in the North Sea and apparently abandoned the Mediterranean to the French navy. Germany increased her army by adding two additional army corps and by doubling the active fleet in commission—instead of keeping a large part in

reserve as theretofore. The Reichstag, though having a majority in opposition to the government, almost unanimously approved the government's proposal to increase the German navy and army.

The Italians were remarkably successful in maintaining radio-communication direct between Caltano, Pisa, and the station at Massowah, Red Sea. The radiograms traversed a portion of the Sahara desert and were transmitted for a distance of 2350 miles.

OPERATIONS OF ITALIAN FLEET DURING JULY AND AUGUST.

The first squadron cruised in the vicinity of the islands in the Aegean Sea occupied by the Italians during July, while the second squadron remained in home ports completing repairs, replacing the guns and preparing to relieve the first squadron during August.

The Italian admiral took measures against any attack by the Turkish fleet to regain possession of the captured islands. Some of the ships cruised in the northern part of the Aegean Sea. The admiral then decided to send a reconnoitering expedition into the Dardanelles to ascertain the condition of the Turkish defences in the straits and the preparedness of the Turkish fleet for a sortie.

THE RECONNOISSANCE OF THE DARDANELLES.

July 14 the flagship *Vettor Pisani,* with the destroyers *Nembo* and *Borea* and five high-sea torpedo-boats, each of 200 tons (*Spica, Perseo, Astore, Climene,* and *Centauro*), left Stampalia for the northern part of the Aegean Sea. At Leros, one of the small islands in possession of the Italians, the torpedo-boats were stripped of all equipment not absolutely necessary; they were repainted with a somewhat lighter color than before, and a third officer was detailed to each in addition to the regular complement. Life-preservers were placed on deck, to be available in case a torpedo-boat should be sunk by gun-fire, that the crew might float thereon with the current, which runs at a rate of from 2 to 4 miles per hour out of the straits, and be picked up by the other vessels of the squadron.

July 17 the squadron steamed to the sparsely inhabited island of Strati (Bozaba), which lies out of the usual route of commerce and on an unfrequented channel. Here Captain Millo joined the

flotilla of five torpedo-boats and with the *Spica* as his flagship took command of the flotilla to personally conduct the expedition. The flotilla left Strati in the afternoon of July 18 for the entrance of the straits of Dardanelles distant about 60 miles, where they arrived about 11.30 p. m. The *Vettor Pissani* and the *Nembo* and *Borea* remained out of sight of the coast, prepared, when necessary, to make a demonstration before the outer forts.

The five torpedo-boats proceeded in column at a speed of 12 knots, which was increased to 15 knots on account of the strength of current. Upon entering the straits they first hugged the Asiatic shore, and then, to avoid the barricade of mines, they went in to the European side of the channel. Fine weather, smooth sea and a dark night favored the Italians, so that they passed in through the entrance between Cape Helles and Kum Kale, which is about two miles wide, without having been observed. They escaped observation at first, though the Turks had four search-lights, two on each cape; one of the four, however, was not in operation at that time. At 12.40 a. m., the *Astore* was picked up by the search-light on Cape Helles just as the flotilla had passed. The alarm was given, guns were fired and rockets were sent up all along the shores of the Dardanelles. Fort Seddul Bahr opened fire on the flotilla.

Captain Millo increased the speed to 20 knots, and then to 23 knots, while the boats proceeded in close order and as close to the European shores as possible, so that the search-light beams might not reveal their position because of the difficulty in depressing the beams of light to illuminate the surface close to the bluff shore. At Suandere, about 6.5 miles northeast of Seddul Bahr, they were again exposed to heavy gun-fire, but none of the shots took effect. The flotilla proceeded up the long stretch through the straits for 11 miles under fire from field-guns and small arms, all along to Killid Bahr, as search-lights along the straits revealed their position to the Turks plainly. At Killid Bahr, the leading boat was stopped by a barricade that effectually closed the passage. During the two or three minutes while the *Spica* was stopped at the barricade, the lights on shore and numerous search-lights revealed the numerous batteries on both sides of the straits, and Captain Millo saw the Turkish fleet of seven ships at anchor six miles to the northward, and the Turkish search-lights revealed among those ships the *Peik-i-Schewket*.

GULF OF XEROS
PENINSULA OF GALLIPOLI
Strait of Gallipoli
IMBROS I.
C. HELLES
Dardanelles
TSCHANAK
GALLIPOLI
THE DARDANELLES
FORTIFICATIONS.
A Fort Seddul Bahr
B Fort Ertogrul
C Fort Kum Kale
D Fort Orhanie
E Fort Suandere
F Fort Kephes
G Fort Kilid-Bahr
H Fort Tschanak
K Fort Bokali
L Fort Nagara
T The Turkish Fleet
16 heavy, 21 to 28 c. m. guns and numerous light guns.
8 to 15 c. m. guns.
80 heavy guns and many light guns.
Soundings in fathoms.

As it was evidently useless to try to pass through this strongly defended narrow passage, and as the crossing beams of search-lights made it almost impossible to clearly distinguish the condition of the Turkish fleet, the flotilla went about and steamed at full speed back to the entrance of the straits, at first in close order and subsequently in dispersed order. At 1.30 a. m. the flotilla rejoined the *Vettor Pisani,* having escaped without any serious loss, none in the crews were wounded and the torpedo-boats were only slightly damaged. The *Spica* had several shots through her smoke-pipe, while the *Astore* and *Perseo* had several shots in their hulls, but the damage was slight.

The Turkish fleet took no part in defending the straits, and in consequence of this neglect the Turkish admiral was relieved of his command and Tahir Bey was appointed Commander-in-Chief.

Every man in the Italian flotilla was highly rewarded for this gallant expedition. Captain Millo was promoted to the rank of Rear Admiral, passing over 25 officers that were senior to him, and he was appointed Chief Inspector of Torpedoes. All the lieutenants in the flotilla were promoted to the rank of Capitaine de Corvette (Lieutenant-Commander). Distinguished-service medals were presented to the personnel by the king, who also gave each of the five boats a special flag.

After this experience the Turks narrowed the open spaces through the barricades and mine fields, without interfering with the free passage of merchant vessels with pilots through the straits.

RED SEA OPERATIONS.

In the Red Sea the Italian naval forces attacked the fortified positions and forts near Hodeida with the *Piemonte, Caprera,* and *Aretusa,* on July 27 and August 12. In the last bombardment the Italians destroyed a Turkish powder magazine.

ON TRIPOLITAN COAST.

The school-ship division, consisting of three *Sardegnas,* two destroyers and six high-sea torpedo-boats, convoyed a fleet of seven transports, with the Tassoni Division of Infantry, from Augusta, August 3, to take possession of Zuara. The navy conducted the landing of this force on August 5 at a point about 3 kilometers east of Zuara. The naval landing force constituted

the van in landing and the guns of the fleet bombarded the coast. The troops were landed by means of the ship's boats and 12 coral fishing smacks.

The recently organized Naval Academy Division, consisting of the naval cadet school-ship *Etna* and the naval apprentice school-ships *Fl. Gioja* and *America Vespuccio,* under the command of Admiral Bono, had in the meantime relieved the troops in garrison in the Italian positions west of Zuara, so that that force could operate against Zuara from the westward simultaneously with the attack from the eastward. The Italian garrison proceeded in three columns under Generals Garioni, Lequio and Cavaciocchi to approach Zuara from the westward and southward. The *Carlo Alberto* followed this movement and supported the march of the column under General Lequio along the coast.

Upon arrival of the Italian forces from all three directions, they found the city almost completely deserted. The occupation of Zuara completed the Italian possession of the entire coast of Tripoli and Cyrenaica. The Turkish-Arabian forces had all withdrawn from the vicinity of the coast, but still held the Italians in check against any prolonged excursions into the interior.

INTERNAL DISORDERS IN TURKEY.

The crews of the Turkish fleet participated with the army in the political affairs of the country. The discontent among the troops in Albania, protesting for political rights and denouncing privileges, spread and caused the formation of the Military League, to which the majority of the naval officers also belonged. This League protested against the Young Turk government and claimed that they had adopted unconstitutional measures, especially during the period of the elections; that they had introduced politics in the army, by which mediocre elements had been favored, to the detriment of the efficient officers; that unnecessary bloodshed must be avoided in regard to the Albanian incident; and finally that the Young Turk government was responsible for the disasters of the war, because of their *failure to prepare for proper defense of Tripoli before the war.*

This Military League was the most potent in causing the downfall of the Young Turk government on July 17 and the dissolution of Parliament on August 5.

On August 4 the League sent a delegation of officers in the destroyer *Nemune-i-Hamie* to Constantinople, to demand the dissolution of Parliament. The destroyer anchored off the Parliament House, and three other vessels were ready to follow her the next day when the demand was granted.

The officers demanded by telegram from Nagara that a naval officer should be appointed Minister of Marine, and threatened to bring the fleet to Constantinople in case their demand was not granted.

The new Minister of Marine, a naval officer, issued an order for all officers to refrain from political agitation, and the League supported this measure. The new government declared martial law as soon as Parliament was dissolved, which was strictly enforced in Constantinople, Salonica, Adrianople and Smyrna in order to prevent any uprising of the Young Turk party. These decisive measures compelled the Young Turks to give up all idea of resistance. The Central Committee of the Young Turks assured the new government that they would refrain from further agitation. The League was disbanded, and August 14 the army officers swore allegiance and declared they would refrain from all political discussion. All officers in the navy and provinces took the same oath to refrain from politics.

These internal disorders interrupted the negotiations for peace for which Italian and Turkish delegates had met in Switzerland.

The fall of the Young Turk government, which could not consider any peace that involved the loss by Turkey of the two African provinces without risking their loss of the control of the government, removed one of the chief obstacles in the proposals for peace. The financial burden and the maintenance of the mobilized army in Turkey created a strong demand for peace by yielding to the demands of the Italians. The prospects for peace seemed promising.

OPERATIONS DURING AUGUST AND SEPTEMBER, 1912.

The vessels of the first squadron of the Italian navy were refitting in home ports when the second squadron sailed from Tarento, August 22, for the coast of Syria. The appearance of this Italian fleet on August 27 and 28 off Jaffa, Haifa and Beirut caused considerable anxiety among the inhabitants of those cities. The fleet, however, merely searched neutral ships for contraband

of war and captured several Turkish sailing ships, after which it proceeded on a cruise along the coast of Asia Minor to the islands in the Aegean Sea occupied by the Italian forces, and thence to the African ports in Cyrenaica and Tripoli.

The *Piemonte* and the four large destroyers left the Red Sea, and the Italian naval forces remaining there were the cruisers *Liguria, Elba,* and *Puglia,* the torpedo-vessels *Aretusa* and *Caprera* and the special ships *Staffeta* and *Governolo.*

The Greeks on islands of the Aegean Sea which had been hitherto under Turkish dominion endeavored to free themselves from Turkish control. The two small islands about 6 miles west of Samos, Nicaria and Furni, with about 15,000 inhabitants, succeeded in overpowering the Turkish garrisons and declared they were independent. They sent delegates to Athens and submitted a memorial to the European powers for recognition of their independence.

The struggle of the Greeks for independence on the Island of Samos was supported by the Independence party in Crete, who endeavored to send an armed expedition of 600 men from Crete to Samos to support the insurrection. They planned to overcome the Turkish garrison of 900 troops and then proclaim the independence of Samos.

The attempt was temporarily frustrated by the English and French cruisers *Diana, Medea,* and *Bruix,* which cruised in the vicinity of Samos. Notwithstanding these efforts, about 300 Cretans managed to land on Samos, and they assisted the Greeks in their war for independence.

During September the commander-in-chief of the Italian armies in Africa, Lieutenant-General Caneva, was recalled and promoted to General of the Army. The two corps commanders Lieutenant-General Briccola in Cyrenaica and Lieutenant-General Ragni in Tripoli were given independent command of their respective districts, with both military and civil control of affairs in those provinces.

September 17 there was a battle at Derna in which the attacking Turks and Arabians were repulsed with a loss of about 111 killed. The Italians lost 61 killed and 113 wounded.

September 20 the Italian troops in Tripoli, under command of Lieutenant-General Ragni, finally succeeded in capturing the Oasis of Zanzur after a desperate battle that lasted ten hours and

in which the Italians sustained a loss of about 200 killed. The Turkish-Arabian troops retreated and intrenched at Zavia, a place not far from the coast, about 16 miles west of Zanzur and 24 miles west of Tripoli.

September 13 the *Etna* bombarded the Arabian position at Zuagla, near the ruins of ancient Tripoli.

The "Popolo Romano" published a statement that at the beginning of September there were 95,000 Italian troops in North Africa and in the Aegean Islands. In Italy there were present in the army 150,000 troops, besides 25,000 Karabinieri and 135,000 recruits.

The Italian war minister published a statement that up to the beginning of July the Italians had captured 88 Turkish officers, 227 non-commissioned officers and 1436 private Turkish soldiers.

The Turks captured Captain Moizo, the commander of the Italian aviation corps, on September 10, as his motor failed while in flight over the enemy's territory between Zuara and Tripoli.

The negotiations for peace in Switzerland continued during September, and probabilities for peace were so apparent that the Turks dispersed the army that had been assembled at Smyrna during August, which returned to its regular headquarters, while the reserves were sent to their homes.

The negotiations for peace were hastened by the threatened war of the Balkan states against Turkey. The second squadron cruised during latter part of September in the Aegean Sea, especially off Chios, Mytilene and Haifa and in the vicinity of Smyrna, with the object of bringing a pressure upon the Turks to conclude peace. This demonstration prevented the Turks from reinforcing their European forces with the troops from Smyrna that had but recently been dispersed.

October 3 the *Coatit* bombarded a Turkish camp in the Bay of Kalamaki on the south coast of Asia Minor, because the Turks had fired upon her as she was towing a prize out of that bay.

The *Coatit* also shelled an infantry battalion on the shore of the Bay of Scalanova that was preparing to cross over from Kapomicali to the Island of Samos. The *Coatit* fired about 200 projectiles against the fleeing Turkish troops and inflicted considerable damage. The commander of the French cruiser *Bruix* is reported to have informed the Italian commander of the *Coatit* that his action was unlawful.

Since negotiations for peace were delayed, the Italians presented an ultimatum fixing the period for acceptance of Italian terms at a date not later than October 15, and at the same time began to prepare an expedition against European Turkey to influence the Turks to accede to the Italian claims. These measures included the departure of the first squadron for the Aegean Sea and preparations for the transportation of an expeditionary army. The first squadron had however just sailed for the Aegean Sea when the news was received that the preliminary peace treaty had been signed, and the first squadron was thereupon recalled by wireless to return to Tarento.

The insurrection on the Island of Samos ended finally by the withdrawal of all the Turkish troops from that island to Chios. The Prince of Samos also fled and the leader of the Insurrectionists, Sofulis, proclaimed a republic.

A number of Italian steamers employed as auxiliary cruisers, among which were the steamers *Duca di Genova* and *Duca degli Abruzzi*, were relieved from naval service.

The Italian operations on land were likewise influenced by the probability of peace. At Derna only, they had some serious fighting. Here 18 battalions of Italian infantry made a vigorous effort to extend the area of the territory held by them around this port. The battles fought around Derna on September 14, October 7 and October 11 resulted in an extension of the area around Derna to include a rectangle of about 8 square miles, 4 miles along the coast and 2 miles back into the interior, where they intrenched and fortified commanding positions on the hills and along the streams flowing to the sea.

The Italians occupied Bomba after making feints at different points on both sides of that port.

In Tripoli everything was quiet after the occupation of Zanzur, and on September 8 the narrow-gauge Italian railroad from Gargaresh to Zanzur, about 14 miles long, was opened for traffic, with a view to further extension to Gharian as progress should be made in occupying the hinterland.

The Italian-Turkish war had prevailed one year on September 29, during which time, by means of 150,000 troops and at a cost of about $100,000,000.00, the Italians had succeeded in capturing and occupying the principal ports, viz.: Tripoli, Homs, Misratah, Zuara, Benghasi, Derna, Bomba, and Tobruk. At Tripoli only, they had

acquired a considerable area, which extended for about 24 miles along the coast and about 8 miles into the interior. The territory occupied at other ports was very small, only about 10 square miles on an average at each port.

At the end of September the Italians had about 110,000 troops in Africa—45,000 at Tripoli and vicinity, 15,000 at Zuara and Sidi-Ali, 6000 at Homs, 10,000 at Misratah, 10,000 at Benghasi, 18,000 at Derna and 6000 at Tobruk. They were opposed by about 40,000 Turks and Arabians, half of whom were around Tripoli. A large portion of the Arabians were however absent on furlough to till the soil.

The Turkish-Arabians had their own field-guns, and as before, they received supplies from across the Tunisian and Egyptian frontiers.

The Italians sustained a loss of about 4000 killed and 6000 wounded in the year's war in Africa, which is regarded as comparatively small. The result is regarded as relatively small from a military point of view, and that meagre result is primarily due to a misconception of the relations between the Turks and Arabian inhabitants of the African provinces. In the beginning the Italians were greeted as liberators from the Turkish yoke, and the Italians expected a small force would be sufficient. At first the Arabians hesitated to oppose the Italians, but their failure to win decisive victories promptly, gave the Turks time to organize their forces and still further retard the progress of the Italians.

THE TREATY OF PEACE SIGNED AT LAUSANNE, SWITZERLAND.

Three envoy-plenipotentiaries from Italy and three from Turkey negotiated the peace of Lausanne, which was signed preliminarily by the negotiators on October 15. In accordance with this treaty, the Sultan of Turkey issued a Firman on October 17 granting autonomy to Tripoli and Cyrenaica, with full amnesty to all the people of the islands of the Aegean Sea who had revolted or opposed the Ottoman government. The Sultan's Firman stated that a new government would administer affairs in Tripoli and Cyrenaica, which would respect the religion and customs of the people as before, and the Sultan's Viceroy—Naib-es-Sultan—Chemsedin Bey, would have charge of Ottoman interests in Tripoli and Cyrenaica. The current laws of the Sheriat will continue in force and the necessary Cadi (principal judge) will be designated by the Sultan.

The King of Italy signed a decree October 17 granting full and entire amnesty to all inhabitants of Tripoli and Cyrenaica who had taken part in hostilities, and all the inhabitants will continue to enjoy complete liberty in the Mohammedan religion as in the past; the name of the Sultan shall continue to be pronounced in public prayers and his personal representative shall be recognized. The emoluments of the Sultan's Viceroy shall be taken from local funds. The rights of the pious foundation (Wakufs) shall be respected and no impediments shall be put between the Mussulmen and their religious leader, the Cadi, and their Naibis, who shall have incomes from local revenues.

Another decree will establish a commission, a part of whom shall be notables of Tripoli, to propose civil and administrative orders inspired by liberal ideals and in keeping with local uses and customs.

The peace plenipotentiaries also agreed to have two commissions, one for Tripoli and one for Cyrenaica, who shall confer with the leading Arab chieftains to persuade them to submit to Italian sovereignty, as in their interest, and to see that all the just demands of the inhabitants are granted. These two commissions were already organized during the middle of October in Libyia.

The Arabian rebel chief Said Idriss was also pardoned. After the publication of the foregoing proclamations, the Treaty of Lausanne was ratified and confirmed on October 18. The eleven articles of this treaty provide essentially as follows, viz.:

Immediate cessation of hostilities.

Recall of all Turkish troops and civil functionaries from Tripoli and Cyrenaica.

The evacuation of all the islands of the Aegean Sea occupied by the Italians.

Exchange of prisoners of war.

Complete amnesty to all the inhabitants of Tripoli and Cyrenaica, as well as those of the Aegean islands.

Italy also agreed to consent to a commercial treaty in which higher duties will be imposed by Turkey and certain monopolies will be granted.

Italy also agreed to support measures to leave Turkey her economic independence, with the right to act in commercial matters in the same way as all other European powers, without being bound by capitulations and other acts now in force in Turkey.

Italy also agreed to suppress Italian post-offices operating in Turkish dominions, when other states having post-offices in Turkey shall suppress theirs.

Italy agreed to support Turkey's efforts to substitute the régime of international law in Turkey instead of the hitherto prevailing capitulary régime.

The Ottoman government agreed to reinstate Italian subjects who had been faithful employees of the Turkish government and who had been dismissed on the outbreak of the war, and to grant them half pay during the months they had been absent on account of the war, and that this enforced absence would not interfere with their claims for pensions, etc.

The Italian government also agreed to pay annually to the Turkish Treasury a sum corresponding to that which the two provinces had paid annually to the Turkish Treasury on an average during three years before the war.

The Italian government recognized that this annuity will not be less than 2,000,000 lires ($400,000.00), and Italy is ready to pay to the Administration of Public Debt the corresponding capitalized sum on demand.

Article XI required that hostilities cease on date of signature, October 18, 1912.

The sovereignty of Italy over Tripoli and Cyrenaica was recognized by Germany, Austria and Russia on the date of signing the preliminary treaty, and by England shortly afterwards, while France delayed in order to define the Tunisian boundaries of Tripoli.

NOTE.—The full text of the Treaty of Lausanne and the royal decree of the King of Italy and the Firman of the Sultan of Turkey were kindly furnished by the Hon. Secretary of State, Philander Knox, for this article, and the facts about the treaty were taken from those official documents.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NOTES ON THE BALKAN WAR.*

By LIEUT.-COMMANDER RALPH EARLE, U. S. Navy.

As the war has been mainly of interest to the army an account of the military operations in detail is considered too lengthy for the PROCEEDINGS, so a brief chronological account only will be given.

The operations of the navies have furnished abundant additional evidence of the necessity to combatants of the "command of the sea."

A brief glance at the situation shows us the nations engaged to be as follows:

Turkey in Europe: area, 65,367 square miles, population of 6,130,000, with a war strength of 1,200,000 men; the infantry weapon is the Mauser 1890; the artillery, the Krupp Q. F. 75-mm. and the Krupp 12-cm. howitzer; and with an additional population of 9,089,000 in Asia Minor, having approximately 600,000 trained troops: is beset by

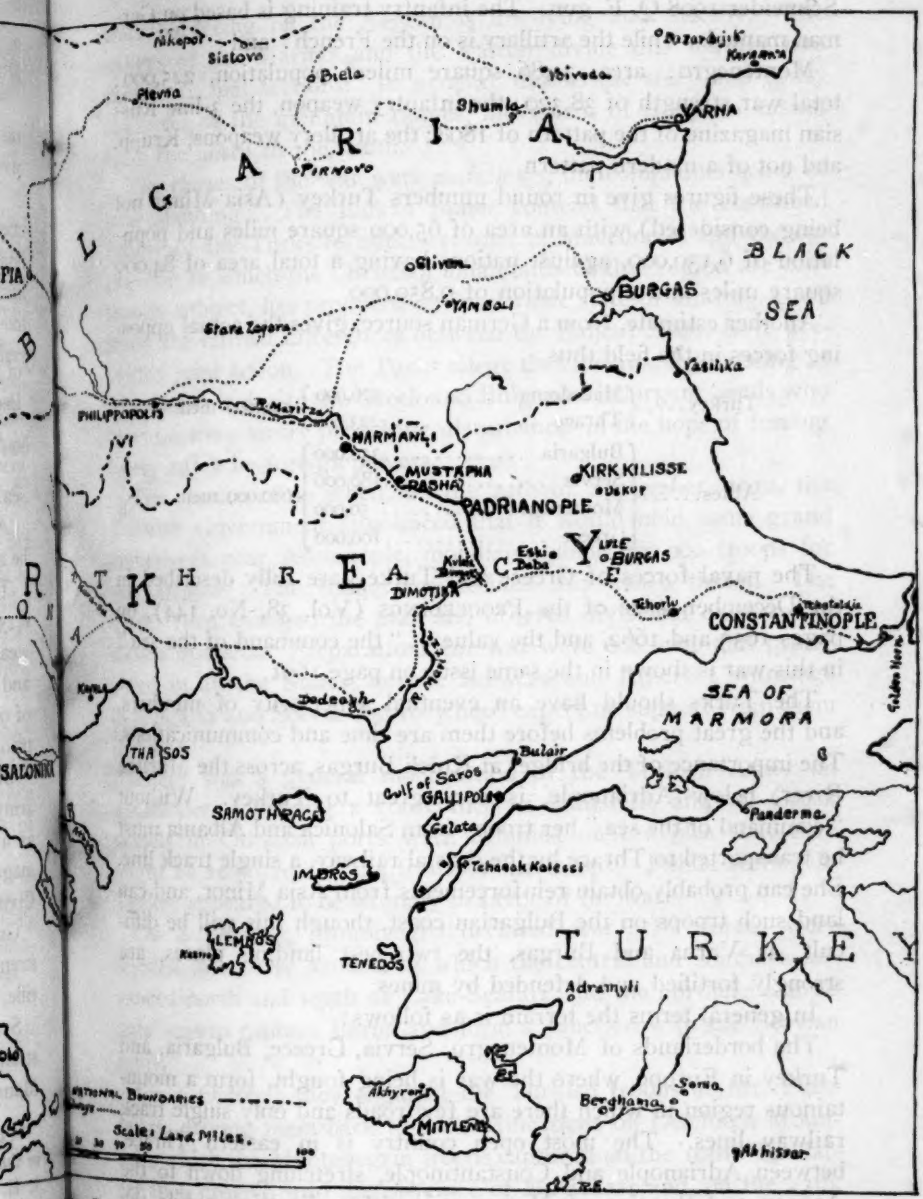
Bulgaria: area, 37,199 square miles; population, 4,035,623; an army, that from its peace establishment of 60,000, becomes 400,000 as a maximum; infantry weapon, the Mannlicher, 1895, 8-mm. magazine rifle; the artillery, the Schneider-Canet field guns and Creusot 12-cm. howitzers:

Greece: area, 24,973 square miles; population, 2,666,000; war strength of 120,000 men; infantry weapon, the Mannlicher 1903 rifle, and the artillery the Schneider-Creusot Q. F. field guns:

Servia: area, 18,649 square miles; population, 2,922,058; war strength, 215,000; infantry weapons the Mauser 1900, the Koka Mauser of 1880 and the Berdan rifle; the artillery weapon the

* Compiled by the editor from the daily press, articles in the *Navy*, one in the *Journal of the Royal United Service Institution* by Major H. A. L. H. Wade, and one in the *United Service Magazine* by Captain H. T. Russell. These books are available at the Institute, and members desiring a detailed account of the war are invited to consult them.

SKETCH TO INDICATE THE RELATIVE POSITIONS OF



SITIONS OF PLACES REFERRED TO IN "NOTES ON THE BALKAN WAR."

Schneider 1908 Q. F. gun. The infantry training is based on German manuals, while the artillery is on the French: and

Montenegro: area, 3,486 square miles; population, 225,000; total war strength of 38,320; the infantry weapon, the 3-line Russian magazine of the pattern of 1898; the artillery weapons, Krupp, and not of a modern pattern.

These figures give in round numbers Turkey (Asia Minor not being considered) with an area of 65,000 square miles and population of 6,130,000, against nations having a total area of 84,000 square miles and a population of 9,850,000.

Another estimate, from a German source, gives the actual opposing forces in the field thus:

Turkey	Macedonia	326,000	549,000 men.
	Thrace	223,000	
Allies	Bulgaria	350,000	680,000 men.
	Servia	180,000	
	Montenegro	50,000	
	Greece	100,000	

The naval forces of Greece and Turkey are fully described in the December issue of the PROCEEDINGS (Vol. 38, No. 144), on pages 1653 and 1662, and the value of "the command of the sea" in this war is shown in the same issue on page 1691.

The Turks should have an eventual superiority of numbers, and the great problems before them are time and communications. The importance of the bridges at Kuleli Burgas, across the Maritza River, below Adrianople, is very great to Turkey. Without "command of the sea" her troops from Salonica and Albania must be transported to Thrace by the coastal railway, a single track line. She can probably obtain reinforcements from Asia Minor, and can land such troops on the Bulgarian coast, though this will be difficult, as Varna and Burgas, the two best landing places, are strongly fortified and defended by mines.

In general terms the terrain is as follows:

The borderlands of Montenegro, Servia, Greece, Bulgaria, and Turkey in Europe, where the war is being fought, form a mountainous region in which there are few roads and only single track railway lines. The most open country is in eastern Thrace, between Adrianople and Constantinople, stretching down to the Aegean and the Sea of Marmora in either direction, while the most hilly country is in Albania, west of the Vardar River. The

tract bordering on the Aegean is low-lying and marshy. The valleys of the Maritza and the Vardar divide this country into three principal sections. In general, due to the steep and rocky character of the mountain ranges, movement of troops is easiest from the north to the south.

The causes of the war were as follows, the complaints being of long standing: The Balkan States contend that the continued failure of the Turks to effect reforms in Macedonia, and the oppression to which the Christian inhabitants of that region are constantly subject, has produced an intolerable state of affairs. Until lately the mutual differences between the Balkan States have prevented joint action. The Turks allege that the anarchy existing in Macedonia is due to the Greek and Bulgarian insurgent bands who traverse the country provoking disturbances in the hope of forcing intervention by foreign powers.

The climax came when, on the 24th of September, 1912, the Turkish Government announced that it would hold some grand maneuvers near Adrianople, mobilizing some 200,000 troops for the purpose. The Bulgarians decided this was a threat. The Turks then changed the plan and ordered divisional exercises in eleven districts. Preparations for war were taken up and prosecuted in all the States, despite Russia's and Austria's warnings to Bulgaria and Servia that they need expect no support from them in a war.

There was a general mobilization of the Turkish Army on 1 October, following a conference of ministers, and all Greek vessels in Ottoman ports were detained on the plea that they might be required for the transport of troops. Public feeling in Turkey appeared to be strongly in favor of the war.

On 8 October Montenegro declared war. Its forces were divided into three armies, of which the central and southern advanced north and south of Lake Scutari, and the northern army's duty was to capture Berna and form a junction with the Servian army.

On 9 October they engaged the Turkish troops at Mt. Planinitza, driving them back to the fortifications on Detchitch Mountain, which the Montenegrin troops captured on the 10th. The latter then crossed into the province of Novibazar and, on the 13th, captured the town of Priepolye.

On the 13th, the Turkish Government detained all ammunition

that was in transit for Servia and seized all the Bulgarian railway cars possible.

The army of Montenegro, on 16 October, took the town of Berna. This date is also that on which the treaty of peace was signed by Turkey and Italy. The Turkish fleet, having been mobilized, on the 12th appeared off the Bulgarian coast.

The formal declaration of war by Turkey against Bulgaria and Servia was made on 17 October, and on the next day the Greeks declared war against Turkey. The first contact between the Turkish troops and the Bulgarians took place on 18 October at Harmanli, the former being repulsed, and the latter on the following day capturing the town of Mustapha Pacha.

The four torpedo boats purchased in Argentina by Greece reached the Piraeus on 22 October.

The Turkish cruiser *Hamidieh* and six torpedo vessels which had been blockading the Bulgarian coast since the 19 October were joined on the 23d by the battleships *Barbarossa, Messoudieh,* and *Assir-i-Tewfik*. Being attacked by three Bulgarian torpedo boats supported by shore batteries, these Turkish vessels bombarded the towns of Varna and Kavarna, firing on the guard houses, customs offices, bridges and harbor buildings. They thus prevented intercourse by water with Roumanian or Russian ports.

On 21 October the Greek fleet, under Admiral Conduriottis, consisting of the *Averoff,* fourteen destroyers and six torpedo boats, with one submarine, seized the island of Lemnos, and following this occupied Thasos, Imbros, Strati, Samothrace and Psara, declaring a blockade of the Epirus coast. At Lemnos the landing took place at Kontari, south of Kastro, covered by the fire of the fleet, it being opposed by the Turkish garrison of 1800 men. The landing party consisted of three battalions and a field battery. The Turks retired to the heights of Mount Probaston. Twenty Ottoman officials were captured.

A Turkish gunboat was sunk in the harbor of Airvali, in Asia Minor, on October 23.

24 October the Bulgarians captured Kirk-Kilisse, the Servians taking Pristina, Kumanova, Karatova, and Kot-chana; and on the next day the Montenegrins surrounded Scutari and effected a junction with the Servian troops at Senitza. On 26 October the siege of Adrianople was begun by the Bulgarians, the town of Eski Baba in its rear being captured. The Servians entered Uskup

on this same date, and the following day they captured Verisovitz with a large supply of war material, a Bulgarian army also capturing Istip, 45 miles to the southeast.

On 28 October the Turkish forces were driven out of Lule Burgas, and on 1 November Demotika was captured, thus cutting the lines of communication with Constantinople.

SKETCH TO SHOW THE ISLANDS AND PENINSULAS TURKEY LOST DURING COURSE OF HOSTILITIES IN HER TWO WARS.

Italy, however, in accordance with the treaty of Lausanne, evacuated all that she had seized.

Sinking of *Feth-i-Bulend*:*—Lieutenant Votsis, commanding the Greek torpedo boat No. 12—a vessel of 85 tons with two torpedo tubes and a crew of 20 men—reports that on the evening of the 31st of October he sailed from Scala Elefterochori at nine. "The searchlights of Karabournow kept their rays steadily on the

*Translated from Moniteur de la Flotte.

strait between Karavofanoro and the entrances of the Vardar, but I passed there steaming at full speed for the harbor of Salonica. I reached there at 11.20, finding the Turkish battleship at the left end of the breakwater, while at the right end there were several vessels and a Russian man-of-war. I steamed carefully, unseen, towards the midship portion of the Turkish ship; I fired the port torpedo, then I turned at full speed in order to be at some distance when the explosion should take place. Turning to port, I fired the starboard torpedo, which struck the breakwater and burst with such a noise that we thought a gun had been fired on shore. At the first explosion we saw lights and heard shouts on the battleship. The officers' quarters were lighted. This explosion took place just forward of the funnel. A large amount of smoke went up, the ship listed deeply and sank by the bows. I then left at full speed, passing before Karabournow, which, warned from the city, turned on all its searchlights; but we escaped their search. Passing before the fort I made good a promise given my crew and fired some 3-pdr. shell at the fort at 2500 meters by way of a salute."

The name *Feth-i-Bulend* means "Good Victory." She was built in 1871, and rebuilt in 1907, doing duty as a schoolship. Her displacement was 2800 tons, armor belt was 8 inches thick, her crew comprised 220 men and officers. It is believed that all escaped.

By 2 November the Turks had been forced back to Tchorlu, and the Sultan then requested the mediation of the Powers. The lines at Tchorlu were evacuated on the 6th and the Tchatalja lines of defense occupied by the Turks.

On 6 November the Greek squadron captured the island of Tenedos, while its army operating in Macedonia * captured Salonica.

In considering the remarkable quickness with which Turkey has thus been driven into such very constricted lines, we should remember that the simultaneous attacks in so many widely different quarters at once by numerically important armies form a remarkable and unparalleled incident in history. Even if the Turkish mobilization plans had been perfect these attacks could

* The Turks operating in Macedonia are in a hostile country and among people adept at guerilla warfare. The roads and railways are very vulnerable and the Bulgarian colonies at Dedeagach and in the Istranja Dagh are a great danger.

hardly have been met successfully, and the failure to do so should not have been unexpected.

Another fact is that the authorities in Constantinople assumed the fatal rôle of outside control of the field operations. All the great disasters in Thrace are said to be due in great measure to this, one instance being the superseding of Abdulla Pasha because he stated his force was unfit to make a forward movement from Kirk Kilisse—now held to be correct strategically—because his army mobilization was so imperfect. Still another cause is said to be the impossibility of making Turkish troops deliver an aimed rifle fire when fighting outside of entrenched positions.

Cholera broke out on 11 November in the Turkish army, and it is said that, in order to prevent the fulfillment of the Bulgarian boasts that the allies would celebrate their entry into Constantinople by a triumphal celebration of Mass in St. Sophia, the Turkish authorities have turned their famous mosque into a pest house.

After attacks on the Tchatalja forts on the 12 November Nazim Pasha, commander of the Turkish army, asked an armistice to discuss peace terms.

The Bulgarians demanded the following:

(1) Withdrawal of the Turkish army from Tchatalja.
(2) Evacuation of Adrianople, Scutari, Yanina and Monastir.
(3) Payment of $140,000,000 war indemnity.
(4) Surrender of conquered territory.
(5) Internationalization of Constantinople.

Monastir, after its evacuation by the Turkish troops, was occupied by the Greeks on 19 November.

The Turkish battleship *Torgud Reis*, on the 15 November, reported shelling the enemy's forces before Djebelkeni, causing heavy losses. The fleet thus assisted in the defense of the Tchatalja lines by shelling the wings of the Bulgarian army.

On 21 November the Greeks landed from the fleet a force at Mytilene—opportunity being allowed the foreign consuls and people to retire into the interior. The Turkish force of 1800 men retired also and made their stand in the mountains, and only surrendered on 22 December.

The Greek fleet has "command of the sea" and, a most important operation, has prevented the Turkish army operating in Thrace from receiving any reinforcements from Asia Minor or from Syria.

A Bulgarian repulse at Tchatalja was reported on 19 November. On the 20th a cessation of fighting took place, but as no agreement on terms could be made, fighting was resumed.

On the night of 22 November, off Varna, an attack on the Turkish cruiser *Hamidieh* was made by four Bulgarian torpedo boats, Schneider vessels of 100 tons displacement and 26 knots speed, which were completed in 1908. Each boat has three 18-inch torpedo tubes, but no guns except 3-pdrs. The Turks say that the meeting of the *Hamidieh* with the flotilla was a chance one, the cruiser cutting through their lines in the darkness, and if this is so, it is more creditable to the Bulgarians, whose boats must have been handled pretty smartly, while the same can hardly be said for the Turkish officers and men, who must have had an easy opportunity of sinking two or three of the torpedo boats with the 6-inch or 4.7-inch guns of the *Hamidieh*, if only they had utilized it. After firing their first torpedoes, the Bulgarian boats continued to attack the cruiser singly for about three hours, but at much greater range. Her crew acted with commendable courage and absence of panic, and the water-tight bulkheads kept her afloat, so that she was able to be towed back to the Golden Horn, arriving with her bows almost flush with the water.

Austria, to intimidate Servia and stop her efforts to obtain a seaport on the Adriatic coast, now massed 300,000 troops on the frontier of Servia, while Germany and Russia called out their reservists.

After the capture of Uskup—26 October—the 4th Servian army marched upon the Albanian coast, surmounting great difficulties in the deep snow on the mountains and hardships incident to lack of supplies. Alessio was occupied on 17 November. On 28 November the column entered Durazzo. The Albanian nobles then proclaimed the provisional independence of Albania, forming a new government.

New peace terms were offered Turkey by Bulgaria on 23 November, Albania proclaiming its independence on the same date.

Severe fighting took place about Adrianople on the 27 November, bombs from aeroplanes starting fires in the city, the Turks making unsuccessful and desperate efforts to break the besieging lines at Dudzaras, being repulsed with heavy losses.

On 29 November the Bulgarians captured two Turkish divisions near the village of Marhamli, between the port of Dedeagh and Demotika.

The Sultan, on 30 November, agreed to sign a protocol, the belligerent armies to retain their positions pending the outcome of the peace negotiations. This was signed at Tchatalja on 4 December by the Turkish, Bulgarian, Servian and Montenegrin delegates, and it is as follows:

(1) The belligerent armies shall remain in the position they at present occupy.

(2) The besieged Turkish fortresses shall not be revictualed.

(3) The revictualing of the Bulgarian army in the field shall be carried out by way of the Black Sea and Adrianople, commencing ten days after the signature of the armistice.

(4) The negotiations for peace shall begin in London on December 13.

Greece refused to sign this protocol, and continued her naval operations. Her reason for not signing was the fact that her demand that Turkey recognize her sovereignty over the islands she had captured during the war was not recognized, and she did not wish to suspend her operations against Yanina, which was occupied by a Turkish garrison of 35,000, part of which had retreated from Monastir on its capture.

The first meeting of the Balkan Peace Conference took place at St. James' Palace, London, on December 16th. The Greeks sent a representative, Venezelos, even while continuing the war, and he proved to be the dominating mind of the conference, insisting on no autonomy for Albania which, if granted, would deprive Greece of considerable territory fought for, and that the islands captured be ceded to Greece.

Early in December a bombardment of Valona and occupation of the Island of Sasseno by the Greek fleet evoked a protest from the new Albanian Government.

Just prior to the signing of this protocol the Bulgarians made a general assault on the Adrianople defenses on the east and west fronts from the direction of Marash. The fighting began at 9 p. m., and lasted six hours, the assailants being repulsed.

The Greeks occupied Koritza on 20 December. Fighting in the neighborhood of Dodona and Kirtovo, a few miles southwest of Yanina, took place on 24 and 25 December.

The Turkish public opinion demanded that a blow be struck at the Greek fleet blockading the Dardanelles, and so on the morn-

ing of December 16th an engagement took place, the account of which is from the *Times* of January 3:

At 9.30 a. m. the Turkish fleet, consisting of four battleships or cruisers, nine torpedo-boat destroyers, and six torpedo boats, appeared at the entrance to the straits. The small craft remained there and the four larger ships came out of the straits and, keeping close to the land, turned towards the north. The Greek fleet, also consisting of four armored ships coming from the Island of Imbros, steered in a northeasterly direction so as to cut across the course of the Turks. The *Averoff*, having superior speed, went on ahead and the remaining three ships formed line abreast and waited for the enemy to come up. At 9.50 a. m. the Turkish ships opened fire at a range of about 15,000 yards. At 10 a. m. the Greek fleet opened fire at a range of about 8500 yards. At 10.04 a. m. the Turkish fleet altered course 16 points and returned as fast as possible, and in broken formation, to the straits, which they entered at about 10.30 a. m. Thus the total time during which either fleet was under fire did not exceed half an hour. The torpedo craft took no part in the action, which merely resolved itself into a skirmish. The following damage was sustained by the Turkish ships during the brief period of fire:

1. *Barbarossa* had one turret put out of action.
2. *Barbarossa's* bridge was totally wrecked by the enemy's fire.
3. *Barbarossa* had her boilers damaged, and a fire started in one of her coal bunkers.
4. *Messoudieh* and *Torgud* showed marks of shell hits in the after part, but no accurate details of the results of these hits are known.
5. The total casualties in the Turkish fleet were 58. The casualties in the Greek fleet were one killed and seven wounded, all on board the *Averoff*, and all were men who were stationed on the bridges.

The *Averoff* received two shell hits on the superstructure near the foremost funnel. None of her guns was damaged or put out of action.

None of the Greek ships was compelled to return to harbor for repairs and the fleet continued to cruise at sea, while the Turkish fleet returned to Nagara for repairs.

From the above facts it will be seen that the Greek fleet continues to hold the command of the sea in the Aegean, and that the blockade of the Dardanelles is as effective as before. The effect of the action has been to cripple the Turkish fleet and, by leaving the Greek fleet undamaged, to render the latter's command of the sea more secure.

On 2 January the garrison of Chios, 1700 men, surrendered after some fighting to the Greek troops.

A very similar skirmish took place on January 4. The official Greek version states that at 7.30 a. m. destroyers cruising off the Dardanelles reported sighting two Turkish cruisers and six destroyers at the entrance to the straits, and the Greek fleet at once steamed to engage them. The *Medjidieh* at 10.30 a. m. left the

main body, steaming to the west of Tenedos, firing shells into the destroyers, but retiring on arrival of other destroyers. About noon both the *Medjidieh* and *Hamidieh* advanced to west of Tenedos, exchanging shots with destroyers, and returning to the straits on the appearance of the Greek squadron.

During the night of January 15, the Turkish cruiser *Medjidieh* stole through Grecian lines and appeared off the Island of Syra. She bombarded powder magazines and coal depots. The *Medjidieh* also fired on the Greek auxiliary cruiser *Macedonia,* which was undergoing repairs in Syra Harbor. The commander of the *Macedonia,* after landing his crew, sank his vessel in the harbor to prevent her destruction.

On January 18 another naval skirmish took place:

The Turkish squadron, after steaming towards Imbros, proceeded towards the south of Lemnos, and stopped twelve miles from that island. The Greek squadron, composed of one armored cruiser, three ironclads of the *Psara* type, and seven destroyers, steamed towards the Turks at noon. The first shots were exchanged at a range of about 7500 yards. Towards 12.20 p. m. the firing became heavy. The Turkish vessels, which were heading to the westward, altered their course and proceeded towards Tenedos, the Greeks in pursuit. At 1.10 p. m. the Greek vessels increased their speed and got within 5500 yards of the enemy. The firing from the *Medjidieh* and *Messoudieh* ceased. At 1.40 p. m. the belligerents were distant from each other by 4000 meters. During the pursuit the firing of the *Barbarossa* and *Torgud* slackened. These vessels were enveloped in steam or smoke, and had a list to starboard. The Turkish line of battle was in great disorder; the ships were steaming ahead at full speed; tongues of flame were seen shooting from their funnels. The Greeks, having chased the enemy almost to within range of the forts at the entrance of the Dardanelles, and having made sure that the Turkish squadron had actually re-entered the straits, retired to the south and continued the blockade.

Throughout January the Greeks made but little headway in Albania and Monastir, the Turks holding their ground.

During the cessation of hostilities Nazim Pasha was murdered in Constantinople. This has caused a great unrest among the Turkish troops.

The Greek Government, on 31 January, notified foreign powers

that coal shipped by way of Dardanelles to Black Sea ports will be subject to seizure unless certified for local consumption at neutral ports.

In January Turkey had 210,000 men between Constantinople and Tchatalja; 50,000 on the banks of the Dardanelles; 10,000 in the Ismid district; 8000 around Panderma; and about 12,000 at Smyrna. Of this force of 290,000 soldiers about 90,000 are trained Nizam (1st line) or Redif (reserve) troops; the remainder are untrained or partially trained Redifs of the second class, Mustahfiz, and irregular Bashi-Bazouks, Kurds. The army is said to be short of horses, field guns, and transports.

The Turkish battleship *Assir-i-Tewfik* ran aground at Karaburnu on the Black Sea during January and being badly damaged by the rocks is reported a total loss.

The Bulgarian official list of killed and wounded in the war gives the following figures: Officers: dead, 284; sick and wounded, 876; total, 1160. Men: dead, 21,018; sick and wounded, 51,000; total, 72,018; grand total, 73,178. It is stated that 70 per cent of the wounded have either recovered or are nearly well again. Many have rejoined their regiments. General Dimitreff, commanding the 3d Army Corps, states that 35,000 of his men became infected with cholera at Tchatalja, but that only 3000 died of the disease. This low percentage (less than 12 per cent) of deaths reflects great credit on the sanitation and hygiene of the Bulgarian troops in the field.

The Peace Conference broke up at 7 p. m. 3 February, all delegates but the Ottoman leaving London, no agreement having been reached. At that hour fighting at Adrianople and Tchatalja was resumed. Scutari,* which had lain invested by Montenegrin troops since 25 October, was assaulted. Yanina was attacked by the Greeks. The Bulgarians, on 6 February, commenced a general attack on Gallipoli, supported by the Greek fleet, and advanced to Bulair.

Tarabosch, on 9 February, was invested by Montenegrin troops.

On 10 February the Montenegrins captured Bardanjoli Hill, which dominates Scutari from the eastern side.

* This is a village of 20,000 inhabitants situated on the southeastern extremity of the Lake Scutari, which is connected to the Adriatic Sea by the navigable river Bojana.

On 14 February the Albanians took the offensive against the allies advancing from Dajakova to Dibra.

On 16 February the Turkish flag and those of the protecting powers on the island of Crete were hauled down and the Greek flag took their place.

A dispute arose between Roumania and Bulgaria as to boundaries, threatening hostilities, but it has been settled by arbitration.

The Turkish troops in Macedonia advanced to recapture Monastir in February.

On 27 February, 1913, Turkey signified her willingness to negotiate for peace with Bulgaria on the basis of the cession of Adrianople.

DISCUSSION.

Life Insurance.

(See No. 144, pp. 1253-1273.)

Naval Constructor D. W. Taylor, U. S. Navy.—I think the Naval Institute is to be congratulated upon the appearance of Commander Nulton's article upon life insurance. This is not only a subject of great general interest which is little understood, but is one as to which naval officers are particularly concerned, and in need of information.

The American Experience Table of mortality given by Commander Nulton has been the accepted table in this country for many years and one wonders if it is not time to revise it in view of the progress in sanitary matters since it was derived. I believe the Combined Experience Table, sometimes called the British Experience Table antedates even the American Experience Table. The question of mortality in the navy has never been investigated by a skilled actuary so it is impossible to say how a naval table would compare with the American or British Experience.

In 1894-1895 a skilled actuary, Mr. L. G. Fouse, of Philadelphia, employed by the Army Mutual Aid Association, made an investigation of the statistics for army officers and produced a table which he considered applicable to the army, excluding war casualties. There is given below a table giving deaths per thousand at various ages from the American Experience Table, the British Experience Table, and the Fouse Army Table:

Death Rate Per Thousand.

Age.	American Experience.	British Experience.	Fouse Table.	Expectation of Life Am. Experience.
21	7.85	7.38	7.16	41.53 years.
30	8.43	8.42	8.45	35.33 "
40	9.79	10.36	11.11	28.18 "
50	13.78	15.94	16.45	20.91 "
60	26.69	30.34	28.17	14.10 "
70	61.99	64.93	61.14	8.48 "

The Fouse Table seems to indicate a death rate of army officers below the American Experience for ages under 30 and over 70, but above the American Experience from 30 to 70. Whether this would apply closely to naval officers it is impossible to say. The majority of the large insurance companies have recently combined to treat army and navy alike in requiring officers in both services to pay premiums as if they were 6 years older than their actual ages. This is certainly not warranted by comparison of the Fouse Table and the American Experience Table and it is believed that naval officers would show up as well as army officers so we must conclude

that the current experiences of the companies is materially better than the American Experience Table, or their experience with the army and navy officers materially worse than the Fouse Army Table. It should be said, however, that Mr. Fouse arrived at his table by averaging the experience of the Army Mutual Aid Association and the army at large and his investigations developed the curious fact that for the earlier ages the Army Mutual Aid mortality has been markedly less than that of the army at large; the latter being materially above the American Experience. This discrepancy became steadily less as the age increased and above 50 there was little or no difference between the two.

It would seem that the experience of the insurance companies has been in line with the results found by Fouse for the army at large. Generally speaking it would seem that the vocational risk in time of peace must be greater for young officers. The war risk is, of course, confined to officers on the active list and is moreover greater for the younger officers. Fouse concluded that for the army the war risk or liability to death in battle or from wounds there received represented a yearly cost for that particular risk of $2.18 per $1000 of insurance at age 25 and diminished to 0 with age 57.

No one can make any real investigation of life insurance without coming absolutely to Commander Nulton's conclusion that "Life insurance in its real sense is protection and not investment." Unfortunately human nature is so constituted that the average person will get into life insurance much more readily if he believes there is something in it for him. Hence the companies are driven to devise all sorts of arrangements combining straight life insurance and investment or saving. This works for good in a way since many people are only induced to take insurance which they should have by the bait of the investment features. As a matter of fact anyone who will carefully figure the returns he may expect from the investment features of any policy will find that his investments are returning him a very low interest. It is not difficult to make such calculations. The table above gives approximately the expectation of life which may be taken as representing what would happen to the average man.

The expression for the amount of $1.00 at compound interest i at the end of n years, the interest being compounded yearly is $(1+i)^n$. In this i should be expressed in absolute terms. Thus for 4%, $i=.04$. The expression for the amount at the end of n years of $1.00 paid in advance each year, interest being compounded annually, is also comparatively simple. This amount is

$$\frac{(1+i)^{n+1}-1}{i}-1.$$

It is generally known that compound interest is a wonderful accumulator and one is at first sight disposed to think that life insurance companies derive the full benefit of it; that is that the payments made by the insured accumulate at compound interest during their lives. This, however, is very far from being the case.

Using the American Experience Table given by Commander Nulton on page 1255, suppose the 85,441 persons of age 30 combine and each puts in

$1.00 annually in advance until his death, the amounts in hand being compounded annually at 4% interest. The total fund thus provided would be $8,197,444, or $95.96 for each of the 85,441 persons. Hence if each person put in $10.42 annually the total accumulation figured as above would amount to $1,000.00 apiece. Now $10.42 per thousand is very different from the $19.00 per thousand given by Commander Nulton as a standard premium for age 30. This is largely because, as already stated, the insurance fund does not get the full benefit of the compound interest for the lives of the contributors. Some of the money put in by the long-lived contributor does not accumulate until his death but must be used at comparatively early stages to help pay the benefits of those who die and the real net amount which each of the 85,441 persons aged 30 should pay in annually to enable each one to have $1000 at death would be not $10.42, but $16.21 for a 4% interest rate. If this $16.21 could get the full benefit of compound interest the rate need be only 2⅓% instead of 4% to cause the fund to amount to $1000.00 per subscriber.

We may adopt an engineering term and call this the effective compound interest rate, the difference between 2⅓% and the 4% being a loss of efficiency, as it were, unavoidable with the level premium life insurance. For the $19.00 premium required, which is $2.79 more than the net 4% premium, the effective compound interest rate need be only 1.7%.

We may look at the matter in another way. Suppose we take the net annual premiums per $1000 for 4% interest and compare them with the net annual premiums required if we could get the full benefit of compound interest. We have seen that for age 30 the net annual premium is $16.21 and the full interest premium $10.42, the former being 56% greater than the latter.

At 20 years of age the net annual premium is 81% greater than the full compound interest premium; at 40 years 39% greater; and at 50 years 29% greater. These figures apply only to the net premium, not to the actual charge with loading, which as you have seen for 30 years age is $19.00 instead of $16.21.

I hope that the preceding will help to make plain the fact that life insurance is a poor investment. The investor may expect to have returned to him on the average materially less than 2% on his money; whereas depositors in postal savings banks can get 2½%; ordinary savings banks usually pay 3%; and a number of mutual savings banks in New England returned very nearly 4% to their depositors in 1911.

I do not wish to be understood as blaming the companies for the small effective interest to holders of insurance policies on the level premium plan. This is mainly due to the fact explained above that from the nature of the case the amounts paid in by a policyholder do not accumulate until his death in the case of the long-lived policyholder.

In the preceding I have used the non-participating payment rate of $19.00 instead of the participating rate which is materially higher for the first payment. When policies are on the participating basis the first payment is materially higher than necessary from the experience of the company. Later payments are made smaller to correspond to the current experience

of the company, the amount of reduction being often represented as a dividend. Of course, it is not really a dividend. If it were it would be easy to make it 100% annually by making the first payment double what it should be.

As regards participating policyholders, even if we accept the roseate prophecies of agents as to the "dividends" to be expected it will be found that the effective interest rates corresponding to the amounts to be paid are substantially the same as for non-participating policies.

Supplementing Commander Nulton's remarks upon the Navy Mutual Aid I would like to point out that in a comparatively small association the deaths in any one year are liable to vary quite widely from the normal.

It happened that in 1911 the deaths were above the normal and as the annual cost of the Navy Mutual Aid insurance depends absolutely upon the deaths during the year, the cost as found by Commander Nulton was but little, if any, below that of outside companies for similar insurance.

There was a great difference in 1912, however, the deaths being not nearly so many and probably below the normal so that the 1911 cost to which Commander Nulton refers was more than 40% higher than the cost for last year, 1912.

I give below the actual average cost per thousand dollars per annum of insurance to all members of the Navy Mutual Aid who have died since the beginning. This is given for 5-year periods except for the first period which is longer.

Period.	Cost per $1,000 of insurance.
1879 to 1887 inclusive	$8.83
1888 to 1892 "	10.36
1893 to 1897 "	12.50
1898 to 1902 "	16.84
1903 to 1907 "	16.88
1908 to 1912 "	15.39

It will be observed that after the gradual increase in early stages the average cost to beneficiaries has remained nearly constant for the past 15 years, the last 5-year period indeed showed a slight reduction.

These are average costs for all deaths. The cost to many decedents, particularly to those who entered young and died early, was much below the above averages. While this is not a place to set forth the many arguments in favor of the Navy Mutual Aid, I would like to give a few facts with reference to one allegation which seems to be widely current in the service though its source I have been unable to discover.

This is that the Navy Mutual Aid has an abnormal number of members 62 years of age and over and is liable to be swamped by them. It is a fact that the number of the 62-year and over class has largely increased during the last 10 years. This is simply because the association being founded some 33 years ago and the majority of members having joined at a comparatively early age it is only recently that it has been possible to have any material proportion of the membership in the 62-year class.

The distribution of the ages of members is such that there has been something of a hump passing into the 62-year class during the last 10 years,

but this has reached its maximum and the number of the 62-year class is again on the down grade. There were 267 January 1, 1911, 269 January 1, 1912, and 266 January 1, 1913.

These people seem very persistent livers and it will be 30 years or more before the last survivors of the present 62-year class disappear, but the actual number in the 62-year class must diminish steadily for a number of years to come—at least ten— and so far as can be humanly foreseen there is no prospect that the percentage of such people will ever again reach the present value.

Now, how can we tell if this percentage is dangerously great? There is a very simple method which will give us a criterion for judgment. Suppose, starting with age 30, we form an ideal association composed of the members of each age in the American Experience Table given by Commander Nulton on page 1255. We would have 85,441 people aged 30, 84,771 aged 31, and so on until we reach the 21 aged 94 and the 3 aged 95. At the end of the year we would have 84,721 survivors of the 30-year class who have now become 31 years old and so on. There would be during the year 85,441 deaths and if we added 85,441 people aged 30 we would have again exactly what we started with a year before. So we may call such an association a normal permanent association for entrance at 30. The total membership would be 3,061,558 of whom 721,283, or 23.88% would be of the age of 62 and over; the average age would be 50.60 years. Similarly for a normal permanent association for entrance at age 25 we would have 20.90% of the age of 62 and over and the average age would be 47.65 years.

In view of the fact that the Navy Mutual Aid 62-year class has a hump which has passed its maximum and must decrease for a number of years to come, there would be no ground for alarm if at the moment the percentage were appreciably above the 30-year figure since the average age at entrance to the Navy Mutual Aid is not far from 30. As a matter of fact, the Navy Mutual Aid report for January 1, 1913, shows 266 members in the 62-year class of a total of 1322, or a percentage of 20.13. This is even below the percentage for a normal permanent association of entering age of 25 and cannot truthfully be represented as excessive or dangerous.

Commander Nulton rather disparages term insurance on the ground that few men desire to carry an increasing burden. Life insurance companies oppose term insurance, or rather prefer other kinds. Perhaps they are not altogether unselfish in this because in term insurance they pay out the money about as fast as it comes in, and there is no chance for that beautiful compound interest which gives sustenance to those engaged in the business of life insurance. If one must be restricted to one kind of insurance the balance of the argument is perhaps in favor of ordinary life, or limited payment life, but the argument is not all on one side and for naval officers a judicious combination is, I believe, the best.

With term insurance one pays according to his current risk, hence it is cheaper for the lower ages, and more expensive for the higher, than ordinary or level premium life, but when we look at insurance as it should be looked at, namely, as a provision against the contingency of the death of the bread winner, and consider that very few men are so situated that they should make the same provision against death at ripe old age as against

death in early manhood and middle life, we begin to see a field for term insurance. No matter what the form, the man who carries insurance to a ripe old age pays for the benefit of those who die young and is a financial loser.

Life insurance is a lottery in which you must die young to win financially. The long lived pay for the prizes. If any one needing insurance could fix the amount which he should have, no matter what his age at death, and also the additional amount or amounts which he should have in case of death in early manhood or middle life, and carry the additional as term insurance until the necessity for it has passed, his cost for insurance during his life would nearly always be less than if he took ordinary life, or a limited payment life. It would certainly be cheaper for those who live materially beyond middle age.

I think the prejudice many people have against term insurance is largely due to the idea fostered by insurance companies that life insurance is a form of investment and that life, or limited payment, policies, owing to the compound interest, pay the highest return.

Commander Nulton quotes an average standard life premium per thousand for the age 30 as $19.00. Suppose we see what could be done if instead of paying $19.00 per annum for life we invest $10.00 per annum at 4½% compound interest and allow it to accumulate and also a sufficient amount in term insurance at *net cost* to make the total accumulation from the $10.00 per annum at the end of each year plus the insurance equal to $1000.00. The results would be as indicated below:

Age.	Accumulation.	Insurance needed.	Cost insurance	Total payment for year.
35	$70.19	$929.81	$8.32	$18.32
40	144.64	855.36	8.37	18.37
45	237.42	762.58	8.51	18.51
50	353.03	646.97	8.92	18.92
55	497.11	502.89	9.34	19.34
60	676.66	323.34	8.63	18.63
65	900.41	99.59	4.00	14.00
70	1179.25	.....	...	....

The accumulation would pass the thousand dollar mark at age 67 when the expectation of life is still about 10 years.

Now, suppose we apply the same method to the 20-payment life, standard, non-participating premium of $27.00 for the age of 30 years accumulating $20.00 per annum at 4½% compound interest for 20 years and then apply compound interest to the accumulation. The results are below:

Age.	Accumulation.	Insurance needed.	Cost insurance	Total payment for year.
35	$140.38	$859.62	$7.69	$27.69
40	289.28	710.72	6.96	26.96
45	474.84	525.16	5.86	25.86
50	706.06	293.94	4.05	24.05
55	879.89	120.11	2.23	2.23
60	1096.51	.....	...	....

The accumulation would amount to $1000.00 at age 58 when the expectation of life is 15 years. If this $1000.00 were allowed to accumulate at compound interest for 15 years more it would become $1935.

It would appear from the above that if one is prepared to save systematically even small amounts, a combination of term insurance and invested savings would give, for a given annual expenditure, the same or more insurance protection for those who do not reach old age and a very much greater financial return for those who do reach it than ordinary life insurance. The interest rate assumed, while perhaps a little above the average for absolutely safe investment, is certainly not unreasonable.

If the American Experience Table is correct the results are substantially correct, mathematically, and the only fallacy is in the assumption that term insurance can be had at net cost, in annually reducing amounts.

This is not the case now, but with the increasing tendency observable, particularly abroad, for the government to go into the insurance business, it may not be many years before term insurance can be had at practically net cost.

Even as things stand, the average officer could probably do better by a combination of term insurance and determined saving than by an endowment policy involving the same expense, and the younger he starts the better he can do.

Commander Nulton's figures seem to be in strong accord with this conclusion. So far as I know, the companies do not write policies for term insurance where the premiums remain approximately constant and the amount of insurance reduced with advancing age. It is very easy to accomplish this result, however, by taking out a number of small policies and dropping them in succession. I have been unable to lay my hands upon non-participating term rates but deducting 15% from the participating rates of a large company for "dividends" I find that by a combination of term insurance and accumulation of savings at 4½% a man of 30 can in 20 years accumulate $1000 and keep the total of accumulation and insurance at $1000 during the whole period for less than $38.00 per annum. For 4% interest this cost will be less than $40.00 per annum. These figures compare with the $43.00 per annum endowment rates given by Commander Nulton for non-participating endowment policies.

Dispersion and Accuracy of Fire.

(SEE No. 144.)

LIEUT.-COMMANDER D. W. KNOX, U. S. Navy.—Lieutenant Long's article is interesting from an academic standpoint, and no analysis of or investigation relating to gunnery is out of place. It is only by complete knowledge and understanding of every aspect that we can reach truly sound conclusions.

Previous discussion of the article has measurably added to its value, but it is the writer's belief that both the article itself and the discussion accompanying it have failed to properly recognize and consider a very essential point, and that the possibility of not having the same duly appreciated throughout the service constitutes a real danger.

The neglected factor referred to is the psychological side of the question, or at least that part of it which will be present in action but not at target practice.

Colonel Maude says:

"Good shooting in action is conditioned by the state of the firer's nerves at the moment he pulls the trigger."

Doudignac says:

"The psycho-physiological disturbances produced . . . . in the presence of danger . . . . are habitually expressed under the form of collapse or under the form of agitation. There is produced:

"1. Enervation of the will muscles, trembling, arrest in movements which thereby become disordered and feverish.

"2. Checked respiration, oppression and restriction of the throat, from which result involuntary vibrations: man is no longer master of his organization.

"3. There is spasmodic contraction of the vessels, paleness, afflux of blood to the heart, dilation of pupils, etc. . . . . *the pupils being dilated the image of the sight is no longer seen or seen only confusedly* . . . .

"To sum up, man on the battlefield, dominated by his emotions, fires with haste, does not use the sight but aims with the extremity of his weapon and even pulls the trigger before having aimed: . . . . he fires without reference to the orders of his chiefs, whom he no longer sees nor hears. . . . . This is the firing of war. . . . . In battle it (the efficacy of fire) depends primarily upon the mental condition of the marksmen."

Considering these influences upon "talkers," sightsetters and pointers there need be no fear lest the dispersion in action, no matter what perfection may have been reached during target practice, will be too small! Range finder operators and spotters will be similarly affected and fire control errors correspondingly increased. It seems probable that disturbing influences of this nature will affect the accuracy of range finding far more than that of spotting, which to my mind is one of the greatest reasons for preference being given to the latter method in the control of the sight bar.

It will thus be seen how extremely harmful Lieutenant Long's article might be if viewed solely from an academic or target practice viewpoint—as seems to have been the case. On the other hand it will have served a most useful purpose if it so stimulates thought and analysis as to result in the inclusion of dispersion and fire control errors as prime factors in the target practice competitions. Rules which make possible an increased score through increased dispersion are fundamentally wrong and are dangerous to war efficiency. Regardless of what hitting is done on an inert target during peace the true test of peace gunnery efficiency is the smallness of the fire control and dispersion errors in combination of course with the rapidity of fire. A target which shoots back will provide more dispersion and fire control errors than are necessary for any purpose except the safety of the enemy!

ENSIGN R. M. ELLIOT, JR., U. S. Navy.—This article, which appeared in the last number of the PROCEEDINGS and the various discussions of it written by officers who are so closely associated with the progress of gunnery in the

navy to-day, should dispel some of the doubts that certainly exist in the minds of a number of officers in the fleet at the present time.

What follows is an attempt to bring out, from a spotter's point of view, the effect that a reduction of dispersion would have upon his work, and consequently upon the accuracy of fire as a whole.

There are three things that prevent a ship from making perfect scores. First, the personal error of the spotter; second, the errors of the range finding and range keeping instruments; and third, the dispersion error, which is further subdivided into the error of the guns and the error of the pointers.

Now, the mathematics in Lieutenant Long's article state practically that for a certain error in fire-control, the error in dispersion should equal a certain amount, and that any reduction or increase of the percentage of dispersion would bring about a reduction of hits. Suppose, then, at some future date, we were to get the science of gunnery down to such a fine point that the exact fire-control errors were known. All that would then be required would be to calibrate our guns so that the dispersion would be equal to a certain amount, provided that the pointers were absolutely accurate. This condition will never be realized, and is absurd. Gunnery will always be capable of improvement.

At present, the things that we must do our best to obtain are, first, a reduction in the errors of the fire-control instruments, second, and beyond anything else, a reduction in the errors of the spotter. If we can, by any means, make the work of a spotter easier, and thus make his estimates more accurate, we shall have advanced a stride in the science of gunnery.

Now, suppose a spotter is watching the fall of an 8-gun salvo, and that all of the shots, except say two, which he immediately discards as wild, fall in a three hundred yard space. He has to do two things, first of all to estimate the mean point of impact of the salvo, and second to apply a correction to the estimated rate of change of range. This it is necessary to apply both to his clock rate and to the correction to be sent to the guns. It is no easy matter, under average conditions of atmosphere, etc., for a spotter to make this estimate, and the greater the dispersion the harder becomes his task. Suppose that it were possible for a ship to fire so that all her eight shots landed in a point of twenty-five yards area, then in four such salvos, even with the present tracking or range keeping instruments, which average an error of not more than 100 yards during the ordinary firing interval, he would most certainly be able to land his shots on the target. In other words, one of the hardest things that a spotter has to do is to find the approximate mean point of impact in a bunch of shots, and the more area that this bunch takes up, the more difficult his work becomes. So, the more nearly that the shots fall together the easier it is for him to find this mean point of impact, and correct the range so as to bring the shots at the foot of the target. If the rate of change projector is used, and if, after the ranging shots have been fired, the salvos are falling somewhere near the target, which it is fair to assume will be the case, we will grant that an error of two points in the course of the enemy, and three knots in her speed has been made. With a good pair of glasses used in an elevated position, the course of the target is not difficult to judge, and there will certainly be enough information

available to know the speed within the error assumed. This combined error, provided that both factors work together, amounts to 100 yards in round numbers, during the average firing interval of forty-five seconds.

Now, by the time that four salvos have been fired, provided that any attention at all has been given to this error in rate of change, it should have been reduced to a practically negligible amount. Therefore, the only other fire-control error left to deal with is that due to the personal error of the spotter in his estimates.

Therefore, it seems, that the sooner we reduce the dispersion to as small an amount as possible, the more shall we reduce the largest of the fire-control errors, that of the spotter's judgment, and the sooner can we hope for more hits.

Naval Discipline.

(SEE NOS. 140, 143, AND 144.)

CAPTAIN T. W. KINKAID, U. S. Navy.—The contributions of Captains Fullam, Pond, and Johnston, and other members of the Institute have thrown much light on the subject of discipline in the navy, and have no doubt aided other officers in formulating plans for the preservation of discipline among their own commands.

But the articles above referred to have dwelt to a considerable extent on punitive measures; and it is my desire to offer a few suggestions relating to improvement of service conditions which would make discipline easier of acquirement for the enlisted man, if not actually attractive to him.

I present my suggestions in what I consider the inverse order of their importance:

THE INFLUENCE OF UNIFORM UPON DISCIPLINE.

It can be readily conceded that much improvement has been brought about in the underclothing of the enlisted force. This item may be considered fairly if not wholly satisfactory. But with the outer clothing the case is different. The barn door front trousers with their bell-shaped legs, the broad collar, the kerchief tie, and the absurd flat cap make up a uniform that has often been described as grotesque.

I admit that a well-formed young man of neat habits, when rigged out in the regulation uniform of the enlisted man, may under favorable circumstances present an attractive appearance. But, take the average sailor on shore liberty, when he is not standing up for inspection by the officer of the deck: is there much to admire in his appearance? Is there anything about it to suggest military discipline?

The blue shirt is too warm for wear in summer weather and not warm enough to afford protection in cold weather. But fortunately an overcoat is available in cold weather.

It may be said that the cooler white uniform may be worn in warm weather. But when Jack is ashore at any season and wishes to visit the theatre or the homes of acquaintances he is practically on a shirt sleeve basis—a fact that must be mortifying to him. Surely he should have a

lightweight coat for summer wear; and he should have a cap not unlike the one worn by chief petty officers. It will be easy enough to provide a distinctive cap for the latter.

I mention the matter of uniform at some length because the garb affects the spirit of the wearer, and, in the last analysis, good discipline rests upon the spirit of the men.

A smart looking uniform, at once comfortable and not too far removed from civilian fashions, would go far toward giving the enlisted force a feeling of contentment that would favor the cause of discipline.

RECEIVING SHIPS AND DISCIPLINE.

I believe that any naval vessel that is under-officered will have difficulty in maintaining a proper standard of discipline. This is especially true of our service, where the proportion of re-enlistments to the total of enlistments is not large.

There is one class of vessel that usually suffers from a shortage of officers, and that is the receiving ship. Sometimes there is but one commissioned officer on board. The result is often plainly evident in the appearance and behavior of the men that go on liberty from these ships. Out of uniform, slouchy, and noisy are expressions that too often are applicable to receiving ship crews. If they salute officers at all it is in a perfunctory and incorrect way. A ship of this kind may be considered a center of infection.

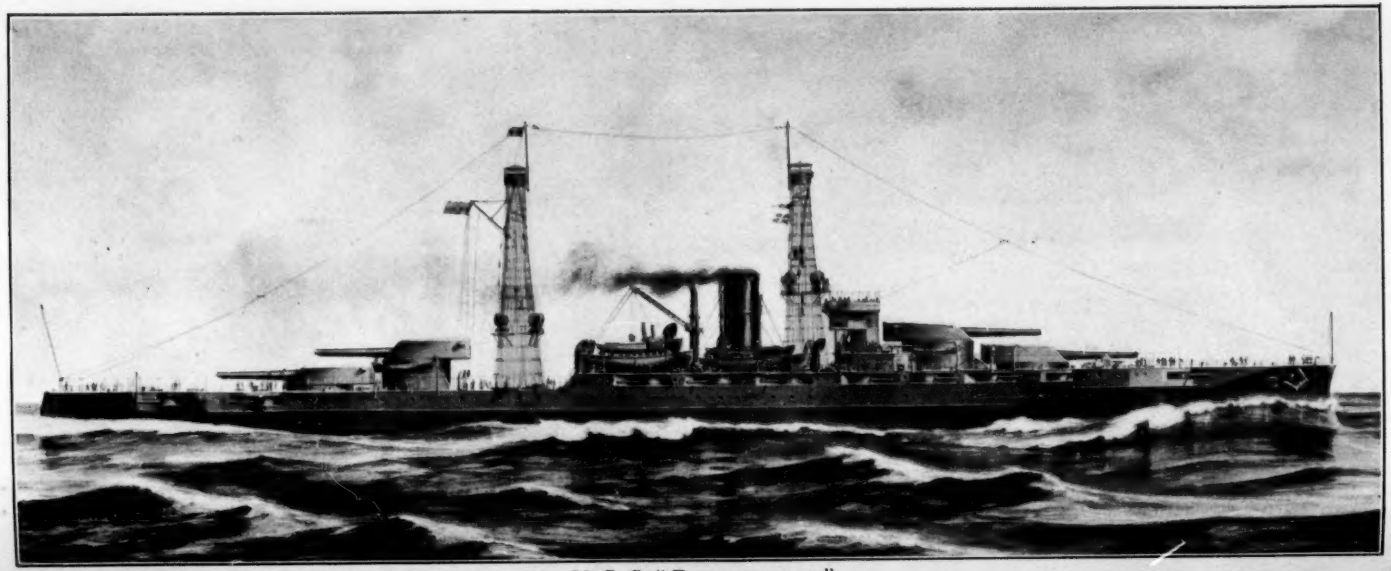
Another source of bad discipline or, rather, lack of discipline, is the torpedo vessel, especially she of the smaller class. The only remedy for such a condition appears to be to permit no recruits on torpedo vessels, and in fact no man who has not served with a good disciplinary record for a year on a larger vessel.

INFANTRY DRILL AS A PROMOTER OF DISCIPLINE.

As a constructive measure for the attainment of good discipline, I know of nothing that can be more highly praised than marching and the manual of arms. The infantryman gets the habit of obedience. In fact, 'mid the rapid succession of orders he has no time to think of disobedience. If the crews of receiving ships and torpedo craft were to get more of this kind of exercise, I am sure that the results could not fail to be most beneficial.

With increased attention to infantry drill on vessels of whatever class, we should expect to see: smarter appearance of the men, a better standard of obedience under all circumstances, and improved respect for superiors. The good discipline of the Naval Academy is doubtless due in large part to the fact that the midshipmen are given a large amount of marching exercise and infantry drill.

Were a visitor on board one of our vessels, taken at random, to observe the enlisted force becomingly attired, messengers coming and going on the run, men saluting their officers properly or standing at attention at the proper times, he might safely conclude from these surface indications that efficiency prevailed on that ship.



U. S. S. "Pennsylvania."

PROFESSIONAL NOTES.*

Prepared by LIEUT.-COMMANDER RALPH EARLE, U. S. Navy.

SHIPS OF WAR, BUDGETS AND PERSONNEL.

ARGENTINE REPUBLIC.

VESSELS BUILDING.

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Rivadavia.....	28,000	22.5	12 12-in., 12 6-in.	Fore River Co.	Launched Aug. 26, 1911.
Moreno.....	28,000	22.5	same	New York Co.	" Sept. 28, 1911.

The battleships *Moreno* and *Rivadavia* should be delivered during this year, but are much delayed in construction due in part to belated delivery of the turret guns.

The twelve large destroyers ordered built in Europe are not all completed; the four built in Germany have been delivered, the four built in England by Armstrong have been sold, and were delivered to Greece just before the outbreak of the Balkan War. The other four building in France have not yet been completed.

The Argentine Navy personnel consists of 763 officers and 7147 men.

DOCKYARD NOTE.—A contract for the delivery within the next nine months at Buenos Aires of a floating dock for destroyers and other light craft of the Argentine Republic has recently been placed with Vickers, Limited. This dock, to be built from the designs of Clark & Standfield, of Westminster, will be of the box or solid type, and it will have a length of 300 feet, a breadth of 60 feet, and a clear width of entrance of 45 feet. It will be capable of receiving vessels up to 16 feet draft and has been designed so as to work in a limited depth of water, namely, 25 feet 6 inches. The lifting capacity of the dock will be 1500 tons, and the equipment comprises pumping and electric light machinery and a steam travelling crane.—*The Engineer.*

*The prevalence of two wars during the year 1912 affected all the European navies. The European powers did all in their power to diplomatically prevent the Balkan War. The final cession of Tripoli and Cyrenaica to Italy as a result of the Italian-Turkish War had the effect of materially strengthening the Triple Alliance in the Mediterranean, and at times during the year the strained relations due to the war threatened to involve other nations and even to cause a general European war. The British fleet was concentrated in the North Sea and the Mediterranean was left largely to France as provided in the "entente-cordiale." During December better conditions were evolved and the war cloud passed. The acquisition of Tripoli and Cyrenaica by Italy also changed conditions so that Italy became a next-door neighbor to England in Egypt. This change was recognized by England's declaration that the port of Solum is a British Egyptian port which is designed to offset the Italian naval base at Tobruk. —*Marine Rundschau.*

AUSTRIA.

VESSELS BUILDING.

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Tegetthoff.....	20,010	20	12 12-in., 12 5.9-in.	Trieste.	Launched Mar. 21, 1912.
Prinz Eugen..	20,010	20	same	"	Launched Nov. 30, 1912.
VII.....	20,010	20	same	Fiume	Laid down Jan. 29, 1913.

BATTLESHIPS.—It is said that number *VII* will mount ten 13.5-inch 45-caliber guns on center-line instead of an armament corresponding to the other vessels of the class.

BUILDING PROGRAM.—In addition to the vessels noted last issue Austria has authorized and prepared for building fifteen 250-ton torpedo-boats, eight submarines of 550 tons, two colliers of 7000 tons coal cargo capacity, one floating dock of 40,000 tons lifting power, two Danube River monitors of 450 tons and two Danube River patrol boats.

BUDGET.—The delegates of the two parliaments of the dual kingdom have voted the Austrian naval budget for 1913 which provides a total of $37,130,000, which is a net increase of about $1,250,000.

PERSONNEL.—The personnel of the Austrian Navy is increased by the addition of 1 rear-admiral, 3 captains, 5 lieutenant-commanders, 31 lieutenants, 12 ensigns, 5 naval surgeons, 27 engineers, 6 navy pay officers, 1 chaplain and 1500 men. The total strength of the navy personnel is fixed at 21,000 men in 1916. The number of men provided in the budget of 1913 is fixed at 12,826 men, an increase of 874 over last year.—*Marine Rundschau.*

BRAZIL.

VESSELS BUILDING.

Name	Displacement	Speed	Armament	Builders	Remarks
Battleship					
Rio de Janiero	27,500	22	14 12-in., 20 6-in.	Elswick	Launched Jan. 22, 1913.

BATTLESHIP "RIO DE JANEIRO."—The battleship *Rio de Janeiro*, launched from the Elswick shipyard by Sir W. G. Armstrong, Whitworth & Co., Limited, on January 22, 1913, was christened by Madame Huet de Bacellar, wife of His Excellency Admiral Duarte Huet de Bacellar, chief of the Brazilian Naval Commission.

Her building to reach the launching stage has thus taken fifteen months. The design of this vessel was made by Mr. J. R. Perrett, the naval director of the Armstrong Co., and Admiral Bacellar, Brazilian Navy, the accepted design being a combination of their original separate plans. It is 632 feet long, 90 feet beam, and has a designed horse-power of 45,000; normal coal supply, 1500 tons; full coal supply, 3000 tons.

The *Rio de Janeiro* will have the huge complement of about 1100 officers and men.

THE "RIO DE JANEIRO" AS DESIGNED BY MR. J. R. PERRETT AND CONSTRUCTED AT ELSWICK SHIPYARD.

Engineer

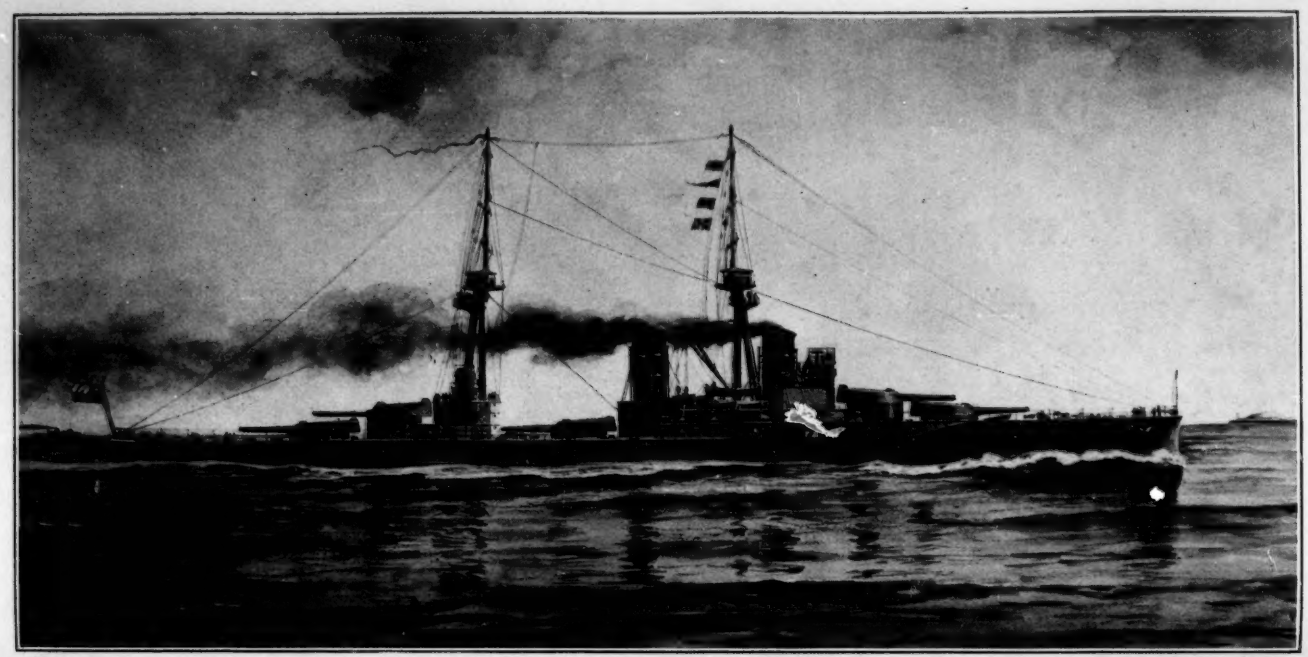
The main armament will consist of fourteen 12-inch guns, twin mounted in armored turrets. The seven turrets are all on the center-line of the ship, and consequently all the 12-inch guns can be trained on one broadside simultaneously. On no other warship up to the present can so many big guns be brought to bear on one broadside, and it is probable that this arrangement represents the last word in 12-inch gunned ships, as it does not seem likely that any increase beyond fourteen will be contemplated. The broadside fire of the 12-inch guns of the *Rio de Janeiro* will be 11,900 pounds, while the ahead and astern fire will be 3400 pounds.

The arrangement of the guns is shown clearly in the drawing. The two forward turrets are on the forecastle deck, the second being superposed. The two turrets amidships are also on the forecastle deck, placed back to back, and separated only by the boat derrick. The remaining three turrets are placed on the upper deck aft, the middle one being superposed.

The secondary armament will consist of twenty 6-inch guns, ten 3-inch guns and three 21-inch submerged torpedo-tubes. As the secondary armament of 6-inch guns is mounted as high as possible in accordance with all the latest designs, the forecastle extends as far aft as the superstructure containing the after funnel, and forms a battery for a proportion of the smaller guns. On the forecastle forward are turrets Nos. 1 and 2, superposed in the usual manner. Next, working aft, is the forward block of superstructure carrying the conning-tower and the bridge, the tripod foremast with boat-derrick, and a large oval funnel. In this block are mounted two 6-inch guns behind armor, each able to fire straight ahead, and half a dozen 12-pounders. Actually on the forecastle, abeam of the tripod mast but outside the superstructure, are two more 6-inch guns provided with shields, which can also fire ahead. Midway between the forward and after superstructures is a stumpy derrick-mast provided with a pair of derricks for dealing with the boats stowed on the platform connecting the two blocks of superstructure. Under the boat-platform are turrets Nos. 3 and 4, so disposed that when their guns are trained axially, the backs of the turrets just clear the derrick-mast. The after block of superstructure carries the after funnel, the main tripod-mast, after conning-tower, and the same number of guns as the forward block. As stated above, there are only three turrets on the quarter-deck, the guns of No. 6, the middle of these, being superposed, are on the same level as No. 1, while the backs of Nos. 5 and 7 just clear the high barbette of the superposed turret, so that normally, when training axially, the guns of No. 5 point forward and those of No. 7 aft.

Fourteen of the 6-inch guns will be disposed in single positions, along the upper deck battery behind 6-inch armor, and the remaining six 6-inch guns will have shields.

The main broadside water-line armor is 9 inches in thickness for a length of 356 feet amidships, and is continued forward and aft, being reduced in thickness, first to 6 inches and ultimately to 4 inches at the extreme ends. The depth for the whole length is 13 feet 6 inches amidships, and, partly to form the citadel already referred to, there are two strakes of 6-inch armor, making the total depth on the broadsides 28 feet for a very considerable portion of the ship's length. Armor 6 inches in thickness extends across the ship as a bulkhead at the forward and aft ends of the main armor, to form raking screens protecting the under-water portions of the ship. The barbettes are of 9-inch armor where they are not behind the broadside armor, and otherwise the combined thickness of barbette and broadside armor is in no case less than 9 inches. The gun-hoods are also of 9-inch armor. Forward of the bridge and at the after end of the superstructure there are conning- and director-towers of 9-inch armor for gun control, the roofs and floors being of 3-inch armor, while the communication-tubes are of 6-inch armor. The conning-tower forward is of 12-inch armor with 6-inch roof and 8-inch tube. As regards the horizontal protection, there is, rising from the armor shelf on the broadsides, a curved protective deck, having a thickness of 1½ inches on the slope and 1 inch on the flat. The deck above this is of ordinary steel, except forward and aft,



NEW CHILEAN BATTLESHIP "ALMIRANTE LATORRE."

where it is on the level of the top of the main armor. Here it is 1½ inches thick, decreasing to 1 inch at the extreme ends of the ship. The deck which forms the top of the citadel is also 1½ inches thick. The ship marks a distinct improvement on the *Minas Geraes* and *São Paulo* in respect to distribution of armor. At the same time, the under-water structure has been very effectively subdivided, there being 17 main bulkheads, in addition to many subdivisions and water-tight flats, making in all 365 water-tight compartments.

The machinery will consist of Parsons' steam turbines working four screws, with Babcock & Wilcox boilers, the furnaces of which are fitted to burn oil fuel as well as coal.

There are many other special features in the design of the *Rio de Janeiro*, notably in connection with gun mountings. It may be added here, however, that connecting the forward and aft parts of the superstructure surrounding the boiler uptakes and the base of the funnels there is a steel girder construction over the two turrets amidships. This structure carries the more important boats. For the lifting of these a special stump mast has been built, extending into the hull of the vessel, and having a height of approximately 80 feet above the upper deck. This carries two booms, one stretching forward and one aft, for lifting the boats. The main standard of this mast is utilized to carry a platform for searchlights.

There are two masts of the tripod type, the foremasts carrying a light jib-crane for dealing with the lifeboats on each side of the forward funnel. The masts also carry searchlight platforms as well as gun-control stations for range finding, etc. It will be noted further from the drawing that instead of the additional or bower anchor being accommodated on the starboard side, as in British ships, it is on the port side. This change has been introduced to suit the mooring in Brazilian harbors, particularly with reference to the prevailing winds.—*The Engineer, Engineering and Naval and Military Record.*

SUBMARINES.—Fiat & Co., of Italy, are constructing three submarines for Brazil.

PERSONNEL.—The personnel strength is 9100 men.

CHILE.

VESSELS BUILDING.

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Almirante Cochrane	27,500	23	10 14-in., 22 5-in.	Elswick	Laid down Nov., 1911.
Almirante Latorre	27,500	23	same	Vickers	" " Dec., 1911.

Of the six 1500-ton destroyers building by White & Co., at Cowes, two were launched in 1912 and named *Tome* and *Talcuhuana* and they have now been sold to Roumania. Two submarines named *Antofogasta* and *Iquique* are being built by the Electric Boat Co. here. Personnel strength of navy is 6080 men.

FRANCE.

VESSELS BUILDING.

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Courbet	23,500	21	12 12-in., 22 5.5-in.	Lorient	Undergoing trials
Jean Bart	23,500	21	same	Brest	Launched Sept. 22, 1911
France	23,500	21	same	St. Nazaire	" Nov. 7, 1912
Paris	23,500	21	same	La Seyne	" Sept. 28, 1912
Bretagne	25,000	21	10 13.5-in., 24 5.5-in.	Brest	Laid down May, 1912
Provence	25,000	21	same	Lorient	" " May, 1912
Lorraine	25,000	21	same	St. Nazaire	" " Nov. 7, 1912
Languedoc	25,200	21	12 13.5-in., 24 5.5-in.	La Seyne	To be laid down May 1, '13
Normandie	25,200	21	same	St. Nazaire	same
Flandre	....	..	same	Brest	To be laid down Oct. 1, '13
Gascogne	....	..	same	Lorient	same

THE BATTLESHIPS OF 1913.—In accordance with the building program four battleships are to be laid down during this year. They have been given the names of *Normandie, Flandre, Languedoc* and *Gascogne*. The dimensions thus far given out are: Length, 574 feet; beam, 91 feet 10 inches; draft, 30 feet; displacement, 25,200 tons. Armament will be twelve 13.5-inch in three quadruple turrets and twenty-four 5.5-inch.

The French are evidently taking a very bold step in deciding to mount 12 big guns (13.4 inches) in three quadruple turrets in ships which are to be laid down this year. M. Doyère, the chief constructor, appears to have recognized a certain unwisdom in taking tentative steps to advance from two guns to three and then to four, and the Technical Section of the Department of Naval Construction, which is not responsible for the decision, has prepared all the plans with rapidity, though it is reported to be ill provided with officers for its exacting and important work. There will be one turret forward, another amidships, and the third abaft, and the whole 12 guns will fire on either broadside. It is estimated that the weight of the 12 heavier guns and their mountings will be equal approximately to that of the 10 guns of the *Bretagne, Provence* and *Lorraine* in five turrets, and from this point of view the advantage of the new design is conspicuous.

All guns fire on the broadside, and the arc of fire of the center turret is greater than in vessels with five turrets because a greater clear space around it on the deck has been provided.

There are, at least, many officers who fear the effect of the concussion which will result from the firing of the whole broadside at one time, or, if the 12 guns should not be fired together, from the concussion of one discharge synchronizing with the vibration caused by its predecessor. It is also a source of regret that the proposed secondary or anti-torpedo armament is the same as in the preceding ships, though in other navies the 6-inch has been adopted.

It is stated that the guns will be so fitted that but two can be fired at the same instant. There was great opposition to these turrets. The risk run that one lucky shot would put out of action four heavy guns seemed ever present, but not great enough to prevent adopting the four-gun turret. The secondary armament will be of 5.5-inch guns.

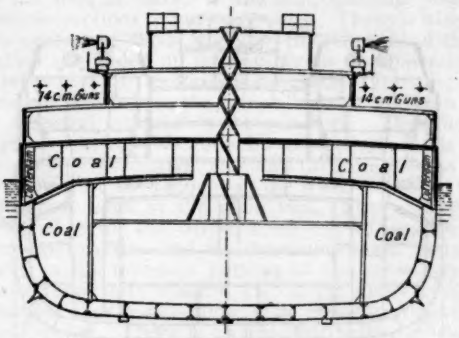
The turrets in plan are an irregular ellipse. The interior is 31.8 feet both ways. There is fitted special protection of armored double underwater compartments against mines and torpedoes.

These vessels should thus be practically unsinkable. A new Frahm system to minimize rolling has been adopted. Steam will be generated by Normand-Sigaudy boilers.

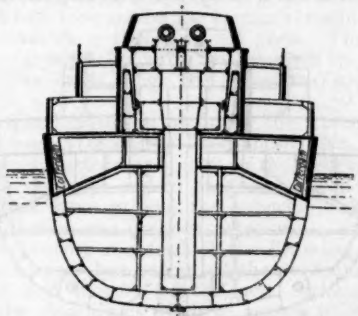
Their speed will be 21½ knots as against 20½ knots of vessels of the *Bretagne* type. Their total displacement will be slightly over 25,000 tons, as against 24,000 tons of their immediate predecessors.

With a view to economy and also to adding to the practical radius of action, two reciprocating engines will combine with two turbines of the Parsons type to produce a speed estimated at 22 knots on trial. So, on the whole, Constructor Doyère's ships will be remarkable specimens of naval architecture, and realize an all-round advance on their predecessors.

The quadruple turrets will be covered with armor 18 inches thick and their imperviousness will be increased by their peculiar shape. The armor belt amidships is to be 12.8 inches thick.—*Le Yacht*, etc.



Transverse Section aft of the Central Redoubt.



Transverse Section through axis of forward Turret.

"THE ENGINEER"

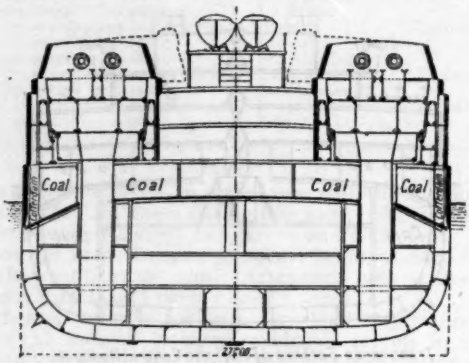
FURTHER DETAILS OF THE "PARIS," "FRANCE," "JEAN BART" AND "COURBET."—These form the first squadron of true dreadnoughts for the French Navy. They were designed by M. Lyasse. The *Paris* must be completed August 1, 1914, or three years after the signing of the contract. In other words the rapidity of French construction is becoming excellent, the *Paris* being launched in nine months after being laid down.

Length	541.2	feet.
Beam	88.56	feet.
Mean draft	29.03	feet.
Full-load displacement	23,467	tons.
Maximum horse-power	26,000	
Estimated speed	20	knots.

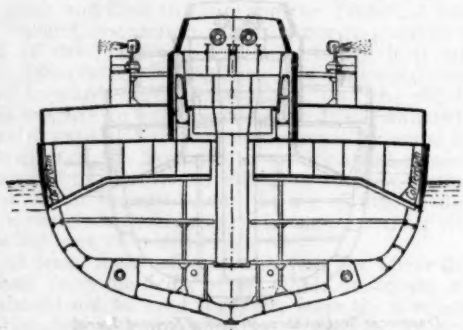
Steam is to be generated in twenty-four Belleville boilers, which will work at a pressure of 256 pounds to the square inch. These are divided into two groups. That forward occupies three consecutive compartments, and is separated by the dynamo compartment from the aft group, which only occupies one compartment. The boilers are arranged in six transverse ranges, each range made up of four units.

The vessel is provided with three funnels. There are four furnaces to each boiler, and they are arranged to burn either coal or liquid fuel, both under natural and forced draft. The liquid fuel burners are to be of the Delaunay-Belleville type.

The propelling machinery is being built by the Chantiers de la Seyne.



Transverse Section through axis of Amidship Turrets



Transverse Section through axis of the Aft Turret.

"THE ENGINEER"

The four propellers will be driven by two symmetrical groups of Parsons' type turbines. In each case an inner shaft is driven by a low-pressure ahead-and-astern turbine, and a wing shaft by a high-pressure ahead-and-astern turbine. Each group is entirely independent of the other. The turbines are arranged in three divisions of one transverse compartment. A high-pressure turbine is in each of the two side divisions, the center division holding the two low-pressure turbines. The low-pressure turbines are of the pure reaction type, and live steam can, if required, be supplied to them so that the inner propellers only may be worked.

Each high-pressure turbine has two impulse wheels with velocity stages—one wheel for ahead and one for astern working—in front of the reaction portion. This arrangement has been adopted in order to avoid having

cruising turbines, which have not given the results anticipated from them from the points of view of upkeep and economy in working. The impulse wheels are always in operation when the high-pressure turbines are in use, and the speed is regulated by the opening and closing of a series of adjustable nozzles. Moderate speeds can, therefore, be attained with a reduced quantity of steam in a way that is now well recognized. By this method the whole of the turbines can be kept at work, and the objectionable results attendant on alternate heating up and cooling avoided.

The system of protection of the *Paris* at the water-line is similar to that of the battleships of the *Patrie* class, that is, there is a cellular caisson with a protective deck at the top and bottom, the lower protective deck sloping upwards from the side, as shown in the accompanying engravings, which represent transverse sections at various points. There is also an armor belt joining the two protective decks, and immediately behind the belt there is a cofferdam which is divided up into numerous compartments. A special feature of the protection of the *Paris* is its citadel. In order to give a sufficiently commanding position to the 6-inch battery, eighteen of them have been placed in a central redoubt on the gun-deck. That the design might not be defective in leaving this redoubt exposed to shells fired into the zone between the upper protective deck and the gun-deck as in the *Charlemagne*, the armoring of the redoubt in the *Paris* has been taken down to the level of the upper edge of the main belt. This arrangement has the further advantage that for the whole depth of the two 'tween decks, the funnels, the ventilation ducts, and the other important parts of the superstructure situated in the midships portion of the vessel are likewise protected. A second redoubt is situated aft on the upper protective deck to shelter the remaining four 6-inch guns. The greatest thickness of the main armor belt is 9.84 inches. There is an armored bulkhead abaft the cellular caisson.

The main armament is composed of twelve 12-inch guns carried in six turrets, two aft and two forward on the center line and one on each quarter amidships. The broadside is therefore ten guns. There are four 18-inch submerged torpedo-tubes. The guns are worked by the Janney electro-hydraulic system. The shells weigh 904 pounds.—*The Engineer.*

BOILERS.—The original intention of fitting the *Lorraine* with small tube boilers as noted on page 1158 of the PROCEEDINGS, No. 143, has been abandoned. She will receive instead 24 boilers of the Belleville system, designed to develop 29,250 horse-power and to produce a speed of 20.5 knots. It is said that the *Dantons* have proved the superior value of the Belleville boilers in steam production and fuel consumption.

The constant maneuvering at sea which the *Première Escadre* has carried out during the present year has permitted the personnel to be familiarized with the armament and motors of the new turbine battleships of the *Danton* class, and the capabilities of these vessels to be thoroughly tested. Hence the importance of the highly favorable reports that have just been made concerning the general efficiency of these semi-dreadnoughts which are held to represent full fighting value compatible with their mixed armament and the faulty distribution of their turrets. Their behavior in the stormy seas lately experienced in the Gulf of Lyons served to confirm the opinion that they could fight their whole armament under practically all weather conditions. The valuable experience gained by the engineering staff has not only permitted early difficulties to be overcome and the fuel consumption to be reduced, but it has also been found possible in the course of recent exercises round Corsica—when testing the tactical utilization of speed—to produce up to 19.5 knots under easy conditions.

The crossing of the Atlantic (Brest-New York) by the Le Pord Division (*Justice, Liberté, Vérité*) at a mean speed of 16.4 knots, and also the four days' voyage at 17 knots of the *Danton, Condorcet* and *Diderot* (from Brest to Toulon) conclusively proved that the continuous sea speed of French battleships is only inferior by two knots to their nominal speed, and no

counterpart to these achievements is yet to be found either in the German or the Italian Navy, though some fine steaming has been done by individual ships belonging to these fleets.—*Naval and Military Record.*

DESTROYERS.—The torpedo-boat maneuvers by the French Navy for defence of the north coast of France proved the failure of the destroyers in bad weather. The 450-ton torpedo-boat proved more efficient in the rough sea than the destroyer *Dunois* of 900 tons.

The new 750-ton French destroyers have not proved to be any more seaworthy than the smaller destroyers.

SUBMARINES.—Two submarines of 720 tons are being built at Toulon and will be designated as high-sea submarines. They will have a special type of steam engines and no Diesel motors. Two 630-ton submarines were laid down at Cherbourg on January 1, 1913. They are of *Gustav Zédè* type.

The numerous accidents with submarines have demonstrated unsatisfactory maneuvering qualities of submarines cruising on the surface with electric power. In narrow channels and in harbors these boats should not proceed under electric power, the ratio of mass to power 400 tons to 700 horse-power, being such that it is difficult to stop the boats' headway in time.

In a six-hour submerged run of the submarine *Foucault* on November 21 there was an explosion of oil by which six persons were seriously injured. The accident is ascribed to bad oil.—*Marine Rundschau.*

The submarine *Newton* rammed the cruiser *Friant* in the harbor of Rochefort and caused such damage that the *Friant* had to be promptly docked. Accident ascribed to defective steering gear on the submarine.

The French submarine *Euler* in proceeding out of Cherbourg for speed trials ran into the breakwater while trying to clear an entering steamer. Her bow was stove in and she managed to return to dock with difficulty.—*Mittheilungen aus dem Gebiete des Seewesens.*

ESTABLISHMENT OF A CONSISTENT BUILDING PLAN.—During the year 1912 the long-desired naval ship building policy was established by which, as in Germany, a definite program will be carried out to provide a fleet in a definite period of 28 battleships, 10 scouts and 52 high-sea torpedo-boats. This program strength is, however, inadequate to preserve the balance of naval power in the Mediterranean since both Italy and Austria are building larger fleets.

CHANGE OF MINISTER OF MARINE.—M. Raymond Poincare became president of the French republic on February 18, 1913, and he previously had appointed M. Pierre Baudin as Minister of Marine to replace M. Delcassé who resigned on January 21.

M. Baudin was born at Nantua in 1863, was president of the municipal council of Paris in 1896, and a deputy in 1898. He was minister of public works from 1899 to 1902. Since 1909 he has represented the Department of Ain in the Senate. For many years he has been president of the Navy League.

M. Baudin has retained Rear-Admiral Lacaze as the chief of staff, which post the latter has held since 1911.

BATTLE-CRUISERS?—Although many naval men and Parliamentary experts agree with ex-Premier Monis' opinion that battle-cruisers are the "embodiment *par excellence* of naval power," on account of the strategic and tactical advantages they offer, it is doubtful if this type of vessel will ever be adopted by the French Navy. The serious study made for some time past of this question has confirmed Admiralty authorities and the most influential members of the Conseil Superieur in the view that it would be a foolish policy for France to weaken her battle line, already limited in

number when compared with the German (28 against 61), by making any sacrifice to speed, as in respect to battle-cruisers the republic has neither the requirements nor the constructional facilities of England. No doubt *Lions* and *Warspites* are unanimously acknowledged to be a splendid investment, for the reason that they more than make up for whatever deficiency they present from a defensive standpoint by a crushing superiority of armament over contemporary battleships of rival fleets, but valuable units of this sort the Gallic Navy cannot, unfortunately, produce, since she has no caliber above the 13.4-inch weapon. Therefore, it would be unwise to construct inferior "croiseurs de bataille" really unfit for the battle line, as are the German *Goebens.—Naval and Military Record.*

ACCIDENT TO THE "MASSENA."—Off the Hyères Islands on January 6 a bursting steam drum caused the death of eight men. The tubing had been recently renewed. There were many acts of bravery during the moments succeeding the accident.

FIRE ON "JEANNE D'ARC."—A fire broke out on board the French schoolship *Jeanne d'Arc* while en route to Rio de Janeiro. It was caused by a short circuit of electric wires in the vicinity of the after magazine. The thick smoke made it difficult to locate the cause of the fire and the after magazine was promptly flooded. The fire was extinguished and for security all the powder of the after magazine was thrown overboard.

ACCIDENT AT TARGET PRACTICE.—Three French naval gunners were killed and a number of others severely wounded by the explosion of a 3-inch gun on board the dreadnought *Danton* during target practice in the roadstead of Salins d'Hyères, on February 18.

GERMANY.

VESSELS BUILDING.

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Kaiserin.....	24,500	21	12 12-in., 14 5.9-in.	Kiel (Howaldt)	Launched Nov. 11, 1911
Prince Regent Leopold	24,500	21	same	Germania Works	" Feb. 21, 1912
König Albert..	24,500	21	same	Danzig (Schichau)	" April 27, 1912
Ersatz K. F. Wilhelm	27,000	21	10 14-in. (probably)	Hamburg	Laid down Nov., 1911
Ersatz Weissenburg	27,000	21	same	Bremen	" " Nov., 1911
Ersatz "S"	27,000	21	same	Wilhelmshaven	Launched Mar. 1, 1913
Ersatz Brandenburg	27,000	24	8 14-in., 12 6-in.	Germania	Laid down Dec., 1912
Cruisers of the Line					
Seydlitz.....	22,600	27	8 12.2-in., 12 3.4-in.	Hamburg	Launched Mar. 30, 1912
Ersatz Kaiserin Augusta	28,000	30	8 14-in., 12 6-in.	Dantzig	Laid down Sept., 1912
"K" 1912.....	28,000	27	same	Hamburg	Laid down June, 1911
Protected Cruisers					
Stralsund.....	5,000	29	12 4.1-in.	Bremen	Commissioned Dec. 12, '12
Strassburg....	5,000	29	....	Wilhelmshaven	Commissioned
Karlsruhe.....	5,000	28	12 4.1-in., 2 t. t.	Germania	Launched Nov. 11, 1912
Rostock.....	5,000	28	....	Howaldt	" Nov. 12, 1912
Ersatz Irene ..	5,000	28	....	Bremen	Laid down
" P. Wilhelm	4,700	28	....	Kiel (Kaiserliche)	" " Oct. 23, 1912

THE "KARLSRUHE" CLASS.—Some scant particulars of the new cruisers *Karlsruhe* and *Rostock* are given in the official *Marine Rundschau* for December. The displacement of this class is 4900 tons, or 200 tons more than the *Breslau*. As was forecast in this correspondence, the armament remains the same, and consists of twelve 4.1-inch quick-firers and two submerged torpedo-tubes. The complement of each vessel is 370. Although the number and caliber of the guns remain the same as those of the *Breslau*, the *Rostock's* and *Karlsruhe's* 4.1-inch quick-firers are of a much improved type. They are 50-caliber weapons of a new and greatly improved model, firing a 39.6-pound shell with an initial velocity of 2950 foot-seconds, and, alternatively, a 30.8-pound shell with an initial velocity of 3275 foot-seconds. This is Krupps' latest contribution to the list of medium-caliber quick-firers, and is held by those who have inspected it to be the finest gun of its size ever turned out. They have entirely new mountings, which enable the guns to be worked by a reduced crew with the minimum of fatigue, this result being attained by the extensive use of anti-friction bearings. Each gun is provided with two seats for the gunlayers, one on each side, and the telescopic sights are adjusted in a manner which makes it possible for the pointer to keep the sights steadily on the target without reference to the movements of the ship, even when it is rolling or pitching heavily. It is possible, furthermore, to train and elevate from either side of the gun. The firing trigger is attached to the hand-wheel training-gear, a most advantageous innovation. The speed of the training and elevating gear can be regulated by special mechanism, and this, it is claimed, is a superior substitute for the shoulder pad, which has ceased to figure in the latest Krupp quick-firers. From all accounts the new gun in question has passed through very severe trials with complete success, the provision of a seat for the gunlayer and the new sights conducing to accuracy in a remarkable degree during long-sustained firing.

This class as well as the *Breslau* has an armor belt 4 inches thick amidships and 2 inches at the ends. They have a protective deck.

Their speed will be but 25 knots, and it is intended that two petrol motors, two stage, six cylinders each, giving a total horse-power of 25,000, will be the motive power.

SPEED OF "GOEBEN," "STRASSBURG" AND "STRALSUND."—The *Marine Rundschau* announces authoritatively that the maximum speed attained by the *Goeben* on her trial was 28.6 knots. This places her a knot less than the *Moltke*. The *Strassburg* made 28.28 knots on her trial, December 12 last. The *Stralsund's* official speed on trial was 28.277 knots with 35.515 horse-power.

German torpedo-boat *S 16*, one of twelve being built by Schichau, made an average speed on her trials of 34 knots and a measured mile speed of 35.3 knots.

THE GERMAN NAVY ESTIMATES.—The total sum to be expended upon the German Navy in the coming year is estimated at $114,504,980, being an increase of a little over $1,500,400. No one who realized the inevitable growth of changes due to the increasing size of ships and power of armaments, together with the large additions which are being made to the personnel, and the greater number of ships to be maintained in commission, anticipated any reduction of expenditure. The total sum includes £36,343,362 for ordinary recurring expenditure, £8,041,562 for non-recurring expenditure, and £635,000 for extraordinary expenditure. The big ships to be laid down in pursuance of the amended navy law are the battleships *Ersatz Wörth* and "*T*" (for each of which a sum of £350,000 is asked), and the battle-cruiser *Ersatz Hertha* and a substitute for the Imperial yacht *Hohenzollern*. There are also the two small cruisers as usual, and 12 destroyers, as well as submarines. The two destroyers sold to Greece have yet to be replaced. The creation of the fifth squadron calls for large additions to the personnel, and 223 officers and 6125 men are to be added (as compared with 50 and 1640 provided last year for 1913), making a total establishment of 3394 officers and 69495 men. Great and apparently successful efforts are being made to secure long-service volunteers, and to in-

duce men to extend their service. The men newly embodied each year will be passed through the new squadron.

According to this budget the cost of the *Goeben* was, for hull and machinery ..... $ 7,287,516
For armor and armament 3,511,250
For torpedoes 232,500

Total $11,031,266
The cost of the *Seydlitz* was a total of $11,171,250
That of the *Kaiser* class 11,888,750
That of the *Kaiserin* class 12,036,250

PERSONNEL MATTERS.—A reform in the personnel branch deserves special mention. This concerns the status of fleet engineers. Last summer the engineer question became acute in consequence of the exposure in a Berlin paper of two astounding letters written by high officials in the service, in which various recommendations were made as to the best means of keeping engineers "in their proper place." How they came into the possession of the Reichstag deputy who published them is still unexplained, but the fact remains that their appearance brought matters to a head. The writer of one letter, who was director of the engineers' school at Wilhelmshaven, has retired, and the Navy Department now announces the creation of a new rank for engineers equivalent to that of engineer-captain in the British Navy. Previous to this the highest rank to which German naval engineers could attain was that of "marine-chef-ingenieur," corresponding to engineer-commander. Finally, an Imperial decree has been issued regulating the service relations between executive and engineer officers. In future an executive will possess no authority over an engineer of equal rank, which means that the chief engineer of every ship will take orders only from the commanding or first officers. This concession, it is hoped, will do away with the anomalous and humiliating position in which even senior engineer officers were placed formerly.—*Naval and Military Record.*

MINE LAYING ACCIDENT.—In Kiel Bay the German cruiser *York* was engaged in laying out mines with her pinnace. As one mine was dropped on the bottom the firing-line fouled the screw of the boat and in clearing it the mine exploded and seriously injured one lieutenant and a sailor and killed one lieutenant and a mate.

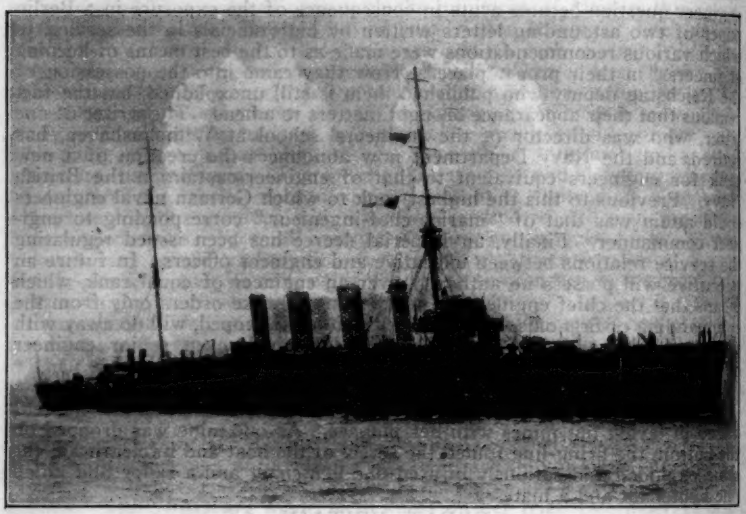
GREAT BRITAIN.

VESSELS BUILDING.

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Ajax	23,500	21	10 13.5-in., 16 4-in.	Scott (Greenock)	Launched March 21, 1912
Audacious	24,000	21	same	Cammel Laird (Birkenhead)	" Sept. 14, 1912
Benbow	26,000	22	10 13.5-in., 16 6-in.	Beardmore	Laid down May 30, 1912
Delhi	26,000	22	same	Vickers	" May 31, 1912
Iron Duke	26,000	22	same	Portsmouth	Launched Oct. 12, 1912
Marlborough	26,000	22	same	Devonport	" Oct. 24, 1912
Qu'n Eliz'b'h	27,000	25	8 15-in., 16 6-in.	Portsmouth	Keel laid Oct. 21, 1912
Warspite	27,000	25	same	Devonport	" " " 31, 1912
Valiant	27,000	25	8 15-in.	Fairfield	Ordered
Barham	27,000	25	same	Brown & Co.	"
Battle Cruisers					
Queen Mary	28,850	30	8 13.5-in., 16 4-in.	Palmer	Launched March 20, 1912
Tiger	28,850	25	same	Brown & Co.	Laid down June 20, 1912
Australia	18,750	25	8 12-in., 16 4-in.	"	Commissioned
Light Cruisers					
Nottingham	5,400	25	10 6-in., 4 3-pdrs.	Pembroke	Laid down June, 1912
Birmingham	5,400	25	same	Elswick	" " May 31, 1912
Lowestoft	5,400	25	same	Chatham	" " July 28, 1912

THE "WARSPITE" CLASS.—The 6-inch battery is to consist of guns of a new and more powerful model. There are to be five 21-inch torpedo-tubes, one in stern, two on each side. There is to be a battery of 3-inch guns. The length will be 672 feet. The horse-power is to be 56,000, boilers of Babcock and Yarrow, burning oil.

THE "MALAYA."—The Admiralty has placed the contract for the battleship presented to this country by the Federated Malay States with Sir W. G. Armstrong, Whitworth & Co., Limited. It is considered extremely likely that the order for the engines will also be given to a Tyne firm. The battleship will cost, it is said, about $11,000,000, and will be the first vessel to be constructed at the firm's new shipyard at Walker, which is now almost ready for occupation. The vessel will be called *Malaya*.



ENGLISH LIGHT CRUISERS "SOUTHAMPTON," "DUBLIN" AND "CHATHAM."

CASEMATE PROTECTION FOR 4-INCH GUNS OF THE "ORION."—The refitting and armament work which has been carried out on board the battleship *Orion*, flagship of the second battle squadron, is almost completed. When taken in hand at Devonport the secondary armament, consisting of sixteen 4-inch guns, eight mounted forward and a similar number aft, was without adequate protection against shell fire, half the number being exposed. The entire armament is now provided with full or semi-casemate protection, which, while enclosing the guns against shell fire, also allows for six being concentrated right ahead and astern, and eight on either broadside, with an equivalent number of searchlight projectors, so placed as not to interfere with the sighting and firing of the guns. The fire-control platform has been altered so as to give more space for the working of the new range-finding instruments.—*Naval and Military Record.*

NEW DESIGNATIONS FOR CRUISERS.—The Admiralty announces it has been decided to discontinue the use of the terms armored cruiser, protected cruiser first-class, protected cruiser second-class, protected cruiser third-class, unarmored cruiser, and scout. In future cruisers will be officially divided into three classes, namely, battle-cruisers, cruisers and light cruisers. The term battle-cruiser will continue to be used as at present, the term

cruiser will be used to designate all vessels at present classified as armored cruisers and protected cruisers first-class, and the term light cruiser will be used to designate the remaining cruisers and vessels hitherto classified as scouts.

SPEED OF THE "PRINCESS ROYAL."—Further speed trials of the *Princess Royal* were held on the Polperro course on January 3, and it is reported that she again made speeds in the neighborhood of 34 knots.

The *Southampton* and her sister ships the *Dublin* and *Chatham* have just entered service. They are fast protected cruisers of 5500 tons displacement, with the high speed of 25.5 knots.

THE ENGLISH DESTROYERS.—The completion of the *Beaver*, which is one of the specially designed boats of the 1910-11 program, brings up the first flotilla to its allotted strength of twenty vessels, of which all were provided for under the estimates of that year. Fourteen of them are of *Admiralty* type, similar to the *Acorn* class of the previous year, and were designed for a speed of 27 knots; they carry an armament of two 4-inch B. L., two 12-pounders, and two 21-inch tubes on a displacement of 780 tons. In the remaining six, of which the *Beaver* is one, the builders were allowed an entirely free hand as regards the machinery arrangements. All these are twin-screw boats, whereas the *Admiralty* designed boats have three screws. In the *Acheron* and *Ariel*, which were specially designed by Messrs. Thornycroft, of Southampton, the builders installed a new system of Parsons' twin-screw turbines of 15,500 horse-power, which produced a speed of over 30 knots. The two Yarrow boats, the *Archer* and *Attack*, were equipped with turbines of 16,000 horse-power of the American Curtis type modified by Messrs. John Brown & Co., and attained over 30 knots on trial, two knots more than the anticipated speed. In the *Beaver* and her sister the *Badger*, constructed by Denny & Co., of Dumbarton, a system of geared turbines was fitted by the Parsons Company. With engines of 16,500 horse-power a speed of 30 knots was expected. In all previous turbine machinery the propellers, being connected up direct to the turbine motors, revolve so fast that much of the power developed is wasted and does not assist in propelling the vessel. By gearing down the rate of revolution of the propellers, it is possible to obtain greater speed from engines of a given power, and other advantages which accrue are economy in fuel consumption and reduction in the space required for the propelling engines.

A further trio of experimental destroyers were allotted to Messrs. Yarrow under the same program, and were built in order to render three boats available eventually for service in New Zealand. Of the same general displacement as the *Acheron* type, they have much more powerful engines, of 20,000 horse-power, and were expected to attain a speed of 32 knots, which they have all more than obtained over a period of eight hours. They are fitted with Parsons' turbines driving twin screws, and are provided with special Yarrow feed-heating arrangements, the builders being allowed a free hand in their design. Though a little larger, they are generally similar to the *Acherons*, and carry a like armament. They have been assigned to the fourth flotilla to act with the *Tribal* class, and the first two, the *Lurcher* and *Firedrake*, have been already commissioned, while the *Oak* has just been delivered from the builders.

The destroyers of the 1911-12 program carry an armament of three 4-inch guns and four 21-inch tubes mounted in pairs. While twelve of them are of a standard type the other eight are of special design, including the *Hardy*, which is being provided with auxiliary Diesel engines for propulsion. To the standard type belong the *Shark*, *Acasta*, and *Christopher*, which are about to join the fourth flotilla at Portland on completion. Their full-load displacement is about 1060 tons, and with engines of 24,500 horse-power they should easily surpass their designed speed of 32 knots in service. Each is the first to be completed of a trio of boats allotted respectively to each of

the firms of Messrs. Swan, Hunter, and Wigham Richardson; John Brown; and Hawthorn, Leslie, and they were laid down in October-December of last year, so that their construction has been rapid. The Brown boats are fitted with Brown-Curtis turbines, the remainder with Parsons' machinery driving three screws. In appearance they are not unlike the *Acorn* class, with three funnels, the center funnel being broader and the forward one higher than the others. Their heavy armament of three 31-pounders, their high speed, and, above all, the increased number of torpedo-tubes make them more than a match for the newest German destroyers, which have hitherto always possessed a superior torpedo armament to British vessels.

It is worthy of note that no less than seventeen out of the forty-three vessels comprising the *Acheron* and *Acasta* classes are of special design. There is no doubt that the data thus obtained as regards system of propulsion will enable the Admiralty eventually to evolve a type of destroyer of the utmost efficiency.

In the following table the details of the *Shark* are compared with those of the *Acorn* type and of contemporary German destroyers:

	Acorn.	Shark.	VI. (German).
Displacement, tons	780	1,060	840
I. H. P.	13,000	24,500	23,000
Speed, knots	27	32	32½
Fuel, tons	130, oil	200, oil	200, coal
Armament	2 31-pr., 2 12-pr.	3 31-pr.	2 24-pr., 2 mach.
Tubes	2 21-in.	4 21-in.	4 19.5-in.
Complement		100	83

The length of the *Shark* is 260 feet, or 20 more than the *Acorn;* beam 26 feet, and draft only 8.3 feet. The torpedo-tubes of the new German destroyers are mounted so that only three can be brought to bear on the broadside.

Meanwhile, the new British destroyers, as they are delivered, will be passed into the fourth flotilla in association with the fast *Tribals* and the three *Firedrakes* just completed, until there are enough of them available to form a new flotilla, which will probably be called the *Ninth,* based on Dundee, which has hitherto been merely a base for submarines. Thirteen are due for completion before the end of March, 1913. The *Fury, Hope, Sheldrake* and *Staunch,* which have lately been serving in the fourth flotilla in order to bring it up to a strength of sixteen, will be transferred to the second flotilla on its return from Scotland for Christmas. This flotilla, which will then consist of the twenty *Acorns,* is shortly to be permanently based on Invergordon, which lies on the almost land-locked waters of Cromarty Firth, on the northeast of Scotland. To form part of the chain of flotillas composed of modern high-forecastle sea-keeping destroyers, there will be the first flotilla of *Acherons,* lately completed by the delivery of the *Beaver,* based on Rosyth. All the above-mentioned vessels burn nothing but oil fuel. At Harwich there are the fifth flotilla of sixteen coal-burning 27-knot *Beagles,* together with twenty fully manned boats of the old *River* class; and at Portland, the mixed group of fifteen vessels already dealt with above.

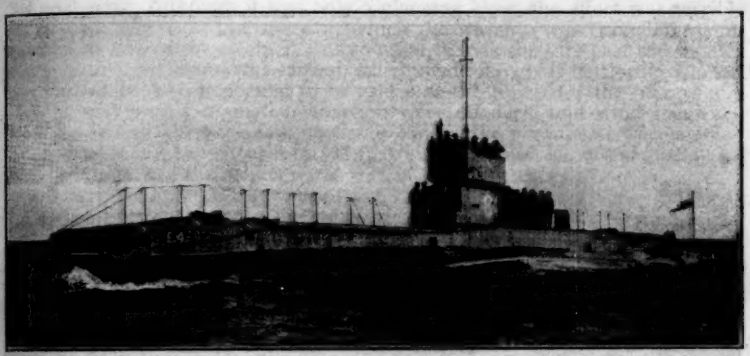
Early in 1914, it is expected that the twenty destroyers of the current program, which are to be similar to the *Acasta* class, will be in commission, at which date the strength of Great Britain in modern destroyers in home waters will be as follows:

Twenty *Darings,* launched 1913; twenty *Acastas,* launched 1912-13, 980-1200 tons, 32 knots, three 31-pounders, four 21-inch tubes; twenty-three *Acherons,* launched 1911-12; twenty *Acorns,* launched 1910, 773-786 tons, 27-32 knots, two 31-pounders, two 12-pounders, two 21-inch tubes; sixteen *Beagles,* launched 1909-10, 860-940 tons, 27 knots, one 31-pounder, three 12-pounders, two 21-inch tubes; twelve *Tribals,* launched 1907-09, 865-1045

tons, 33 knots, five 12-pounders in five, two 31-pounders in seven, two 18-inch tubes; one *Swift*, launched 1905, 2170 tons, 36 knots, four 31-pounders, two 18-inch tubes; and twenty-six *Rivers*, launched 1903-08, 540-590 tons, 25.5 knots, four 12-pounders, two 18-inch tubes.

A total of 138 vessels capable of operating in the North Sea in all weathers.—*Naval and Military Record.*

THE MINE-LAYING SQUADRON.—This is composed of the *Andromache, Apollo, Intrepid, Iphigenia, Latona, Naiad* and *Thetis*. All vessels are being fitted with wireless, and with four 4.7-inch guns so mounted as to command a wide arc of fire without interfering with the submarine mine equipment.



"E-4" BOW VIEW.

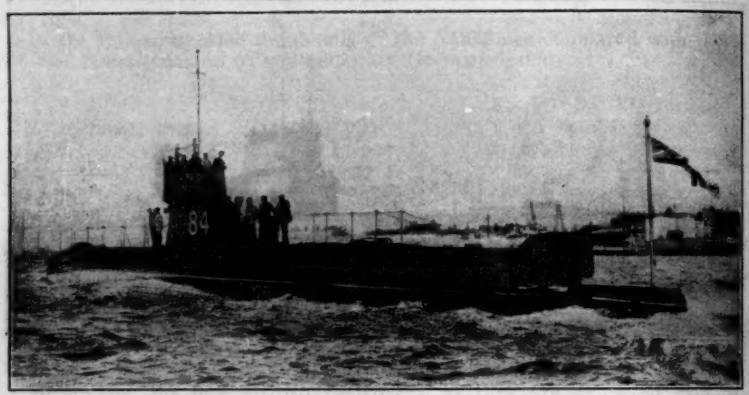
LIGHT CRUISERS.—Preparations are being made at Pembroke to build an armored vessel of comparatively small tonnage and high speed, which will be able to hunt down and sink destroyers in any weather. She is to be 410 feet long and of 30,000 horse-power, on a displacement of about 3000 tons. An armored belt will give this new vessel protection throughout her whole length, the thickness varying and being least towards the ends. The vitals, however, will be covered with plates about five inches thick, sufficient to prevent penetration by a 4.7-inch projectile at moderate ranges. We have previously discussed in the columns of the *United Service Gazette* the possibility of armored destroyers; and the projected ship appears to us to be only a glorified destroyer encased with armor. The exact tonnage is not yet known outside a small board of officials, but the speed will have to be very high, as it is anticipated that the 1911 batch of destroyers will far exceed the 31.33 knots they are designed for, and they may reach the *Swift* maximum of 36 knots. To overtake such vessels in smooth water a chasing ship will need 38 to 40 knots, if the distance to a friendly port is short when the destroyer is sighted. If the pioneer craft should reach 37 or 38 knots, however, her subsequent "improved" sisters would soon reach the 40 knots we have so long been promised in torpedo craft when the government was prepared to foot the bill. High speeds in marine vessels means high price, or we should already have attained to 40 knots the hour in our torpedo craft.—*United Service Gazette.*

ENGLISH SUBMARINES.—The *E* class, now under construction, are 176 feet long, 23 feet wide, with a surface displacement approximating 800 tons.

With 750 shaft horse-power they are expected to have a speed of 16 knots on the surface. The under-water motors of 600 horse-power should give these vessels a speed submerged of ten knots. They will carry four of the largest torpedo-tubes, but will not carry the 3-inch guns originally intended. There are four of this class all to be in service by the end of March, 1913.

The *F* class, *F 1* to *F 8*, will be of about 1200 tons displacement with a speed of 20 knots on the surface and 12 knots submerged.

COALING.—The battle-cruiser *Indomitable*, during the coaling of the squadron at Berehaven, took on board 816 tons in 2 hours and 1 minute, the average per hour being 404.63 tons. The next best performance was that of the battleship *Hercules*, which took in 654 tons in 1 hour and 45 minutes, the average per hour in this case being 370-71 tons.



"E-4." STERN VIEW OF SUBMARINE ENTERING PORTSMOUTH HARBOR.

PROBABLE BUDGET.—According to the *Daily Mail* the work of framing the British Navy estimates for the coming year is nearly completed. The one point remaining for decision, namely, whether five or six battleships shall be laid down, depends upon the Austrian naval program. The naval program will, according to present information, involve an expenditude of $240,000,000, and will include five battleships, six light armored cruisers, twenty destroyers, a number of submarines and an addition to the personnel of 5000 men, making a total of 142,500 officers and men.

SCOTTISH NAVAL STATIONS.—The Admiralty at the War Office is proceeding to fortify the entrance to Cromarty Firth. Such a step is abundantly justified by the growing strategical importance of the place, and will add to its security and value for naval purposes. It is understood that forts are to be placed on the two headlands on either side of the narrow entrance to the Firth, on Castlecraig on the Nigg or north side, and on Cromarty Hill on the south side. Meanwhile, in the Firth itself it is reported that new moorings are being provided for warships, and accommodation for oil fuel is being made at Invergordon.

CIVILIAN CLOTHES FOR MEN.—The privilege of wearing private clothes when on long leave and when on short leave at the three home ports, *i. e.*, Portsmouth, Devonport and the Nore, has been granted by the Admiralty to chief petty officers and petty officers of the navy, N. C. O.'s of the Royal Marines, leading rates and men with one or more good conduct badges, and the same concession is extended to chief petty officers, petty officers, and non-commissioned officers at Portland, Weymouth, Dover, Harwich,

Queensferry, Dundee, Pembroke and Queenstown when on short leave, provided their homes are in the vicinity of those ports. Uniform is always to be worn on leaving or returning to the ship or establishment. The privilege of wearing plain clothes may be withdrawn for misconduct, and power is retained by the naval authorities to suspend the permission to wear plain clothes if desirable for disciplinary or other reasons.—*United Service Gazette.*

"CENTURION'S" COLLISION.—The night of Monday, December 9, was very dark, but the atmosphere was clear, and all went well until about 5.30 Tuesday morning, when the *Centurion* was off Portland Bill, and steaming at nearly 19 knots. Suddenly a steamer was seen to be crossing the bows of the *Centurion,* and before the necessary steps could be taken to avert a collision, the starboard bow of the battleship had struck the steamer on the port side. Although it was only a glancing blow, the effect was terrible in its consequences. The speed at which the warship was travelling, compared with that of the steamer, was so great that as she tore past the smaller vessel a grinding sound was caused, which made the great battleship vibrate, and roused all who happened to be asleep at the time. Of the officers and men on watch only a small proportion were on deck, and what happened was so sudden that very few probably could give a connected account of what occurred in the short interval that elapsed from the moment the two vessels struck and the steamer was left in the wake of the battleship. It is stated that one man on the deck of the steamer was seen to jump evidently in the hope of gripping the deck rail of the *Centurion,* but he failed in the attempt and fell between the sides of the two vessels. As to what happened to the steamer only one man on board the battleship, it is believed, can make any definite statement. This is a marine, who says that after the collision he saw the steamer dive and disappear.

On board the *Centurion* everything possible was done to minimize the effects of the collision. The engines were stopped and then put full speed astern, but, with the vessel steaming at 19 knots, she had travelled nearly a mile before she had lost way altogether. Then her head was turned to return to the scene of the collision. In the meantime lifeboats had been manned, and searchlights turned on, but the search was rendered somewhat difficult by the smoke from the *Centurion's* funnels.

For two hours the search was continued with the aid of the *Centurion's* lights, but without result. Some who shared in the search from the upper deck of the battleship believe they saw a water keg, but this seems to be doubtful. At any rate, although the *Centurion's* boats were manned, they were not lowered from the davits. The sea was choppy at the time, but everything was in readiness to lower boats if anything had been sighted that would have given the slightest hope of saving life. When daylight came there was not a ship to be seen, and the hope can hardly be entertained that any of her crew have escaped. After the collision the port light of the steamer was picked up on the torpedo-net shelf of the battleship, and the name of the makers found on the light led to the discovery that it had been sold to the Italian steamer *Derna.* The identity of the vessel is further established by the fact that there has been washed ashore on the Isle of Wight a boat, in which was a dead body and which bore the name *Derna,* Genoa.

Considering the extent of the damage sustained by the *Centurion,* it is remarkable that all the officers and men on board escaped injury. The starboard bow of the vessel is very badly damaged, and the stem is turned slightly to port. Of the two anchors carried on the starboard bow, one was driven right through the plating, while the other was snapped off in the thick part of the shank—a piece of cast steel measuring 10 inches by 14 inches. One of the hawsepipes, also of cast steel, was broken; and, as the sides of the two vessels grazed each other, stanchions and other deck fittings snapped off like matchwood. Net shelves and net defence booms were also badly damaged, and a large number of plates dented and bulged, while the

steamer's port light was carried away, and fell on the deck of the battleship. It is stated that after the collision the steamer's whistle was heard, but it is feared that her crew could not have had time to lower a boat or get clear of the vessel before she sank. All the damage to the *Centurion* is above the water-line, and so high as to indicate either that the missing steamer was very much out of the water or struck the bow of the battleship at the top of a swell. It is expected that nearly three months must elapse before the *Centurion* can resume her trials, owing to the difficulty in replacing the hawsepipes, which are of cast steel.—*Naval and Military Record.*

ACCIDENT AT SHOEBURYNESS.—Early in January another accident to a 13.5-inch A-gun took place at the proving ground. Owing to an extraordinary charge of cordite, weighed by error, the breech was blown off and two men killed. The explosion took place on the seventh shot.

THE ENGLISH NAVY IN 1912.—The British policy in regard to maintenance of the two-power standard was changed and the declared policy is now for England to maintain a 60 per cent superiority over the German Navy. But this is not to be so limited as the British Admiralty have decided to build two ships for every German ship.

The most important changes made in the British Navy during the year were:

1. The transfer of the Mediterranean squadron, the fourth squadron, to Gibraltar and the recall of the Atlantic squadron to home waters. The new distribution of the British Navy is: First fleet consisting of four squadrons of eight battleships each with full complements; the second fleet having reduced complements in two squadrons; the third fleet having two squadrons with only a nucleus of a complement. At present the first fleet lacks four battleships, the second fleet lacks eight battleships and the third fleet lacks one battleship. The distribution of the cruisers, torpedo-boats and submarines was likewise changed so that at present the lighter naval forces are all stationed on the east coast of England and Scotland.
2. The British Admiralty established the Naval General Staff.
3. The Mediterranean naval forces were redistributed, the third battle squadron leaving Portland on October 30, 1912.
4. The navy returned to the former continuous commission system.
5. The warrant and petty officers are now admitted to rank of commissioned officers.
6. The business methods of the Admiralty were changed.
7. A royal flying corps was established.
8. New disciplinary regulations were adopted.
9. The pay of the British Navy personnel was increased.

The British colonies manifested their loyalty to the British crown by providing aid for Imperial defences. The example of New Zealand in providing the battle-cruiser *New Zealand* for the British Navy has been followed by the gift of a dreadnought by the Malay States, while the Canadian Government is debating on doing likewise.

There was no fundamental change in type of warship developed during the past year. The latest battleships will have displacement tonnage of about 30,000 tons. A new type of small armored cruisers of about 4000 or 5000 tons displacement is being built especially for torpedo defence and protection of commerce.

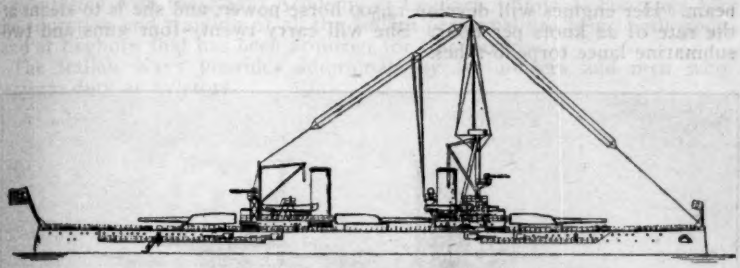
The strength of the British Navy personnel was increased by 2000 men.

GREECE.

The battleship ordered by the Grecian Government to be built by the Vulcan Shipyard at Stettin for $8,640,000 will have the following dimensions: Length, 458 feet; beam, 70 feet; draft, 23.5 feet; displacement, 19,500 tons. The main battery will consist of eight 14-inch guns built by the Bethlehem Steel Company mounted in three center-line turrets. There will

also be twelve 6-inch, twelve 3-inch and four 1-pounders. There are two 21-inch torpedo-tubes. There will be an armor belt of 10-inch thickness. The turrets will also be 10 inches and the conning-tower 12 inches. She will be driven by three Curtis turbines of 43,500 horse-power and is expected to develop 23 knots. She will have a steaming radius of 2500 miles with 1200 tons of coal. Torpedo nets of the Bullivant type will be fitted.

The large armament on such a small vessel requires sacrifices in steaming radius and other respects. She has a very low freeboard. Both of these defects really amount to little as she is destined to fight always near her base of supplies and in smooth water.



GREEK BATTLESHIP "SALAMIS."

A sketch of this rather unusual type of battleship is given herewith.—*La Vie Maritime.*

ITALY.

VESSELS BUILDING.

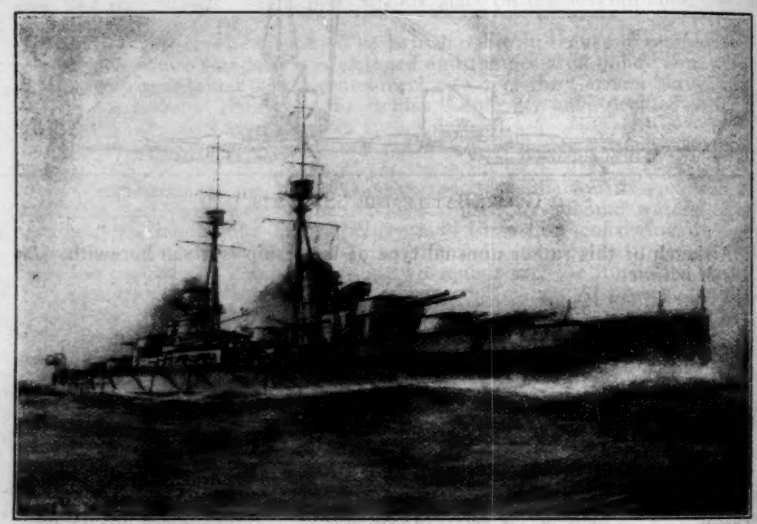
Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Cavour	22,000	22	13 12-in., 18 4.7-in.	Spezia	Launched Aug. 10, 1911
Giulio Cesare	22,000	22	same	Ansaldo-Armstrong	Undergoing trials
Leonardo da Vinci	22,000	22	same	Genoa (Odero)	Launched Oct. 14, 1911
Andrea Doria	25,000	23	13 12-in., 16 5.9-in.	Spezia	Laid down Mar. 24, 1912
Duilio	25,000	23	same	Castellamare	" " Apr. 30, 1912
Dandolo	28,000	25	10 14.2-in.	....	Projected
Morosini	28,000	25	same	....	"

GUN TRIALS OF THE "DANTE ALIGHIERI."—The guns of the triple turrets on board the battleship *Dante Alighieri* were tried during the latter part of November, 1912. Five projectiles were fired from each of the 12-inch guns in the triple turrets. Two shots with reduced charges, one with practice charge, and two with full-service charges from each gun.

One shot was fired from each gun at first, then two shots were fired from two guns in the same turret at the same time and finally one shot was fired from all three guns in a triple turret simultaneously. But the salvo from the three guns was not with service charges. The practice was satisfactory and caused none of the disturbing effects that were feared. All the turret training machinery and other auxiliary engines that had previously lacked some desirable qualities, worked well. The twisting or turning effect by firing one gun in a triple turret on the training of the gun

along side was less in the triple turret than that caused by firing one gun upon the training of its neighbor in a double turret. The simultaneity of the discharge of the three guns in the triple turret was not quite perfect, so that the effect of firing the three guns caused no perceptible influence on the ship.—*Marine Rundschau.*

NEW CRUISER.—The cruiser *Libia,* launched recently at Sestri Ponente, was originally ordered by the Turkish Government, under the name of the *Drama;* but she has now been acquired by the Italian Government. The *Libia,* which has a displacement of 3800 tons, is 345½ feet long by 46½ feet beam. Her engines will develop 12,500 horse-power, and she is to steam at the rate of 22 knots per hour. She will carry twenty-four guns and two submarine lance torpedo-tubes.



ITALIAN BATTLESHIP "CONTE DI CAVOUR."

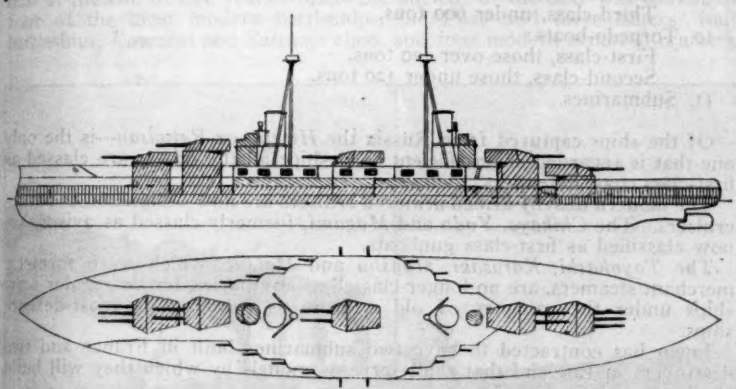
The second Italian dreadnought, built at Spezia, carrying thirteen 12-inch guns mounted in three triple and two double turrets, all on the keel line, also eighteen 4.7-inch and fourteen 12-pounders. Blechynden boilers; Parsons' turbines; 24,000 horse-power; estimated speed 22 knots. See December, 1911, PROCEEDINGS for discussions of this class of vessel, page 1438.

SUBMARINES.—The Italian submersible *Jantina,* just launched for the Italian Navy, is 150½ feet long by 15 feet beam. She has a surface displacement of 243 tons, increased to 300 tons when submerged. Her surface speed is 13 knots, and her submarine speed 8½ knots. A torpedo-boat, known at present as the *A. S. 29,* has been launched at Sestri Ponente; she is 141¾ feet long by 15¼ feet beam. She has a displacement of 130 tons, and is to steam at the rate of 30 knots per hour. She will be used for the defence of the Italian coast. The submarine *Atropo,* built for the Italian Navy in Germany, has given a surface speed of 14.30 knots per hour; she is 148¾ feet long by 14¾ feet beam. It is expected that the next submarines will be of 550 tons displacement.

BUDGET.—The budget for 1913 appropriates 262,300,000 lire, about $52,460,000, or about ten million dollars more than for the previous year. The funds provide the installments for completing the ships building, viz.: Battleships *Duilio* and *Doria* laid down in 1912 and two cruisers of 6000 tons, besides two colonial cruisers *Campana* and *Basilicata* to be built with a number of torpedo vessels. Two submarines, one of which is being built in Germany at Stettin, two oil-fuel ships with a cargo capacity of 6000 tons of fuel oil, one transport and several auxiliaries.

PERSONNEL NOTES.—All the Italian training stations are hereafter to be concentrated with the Naval Academy at Leghorn. Suitable buildings for the education and training of all the Italian personnel are being built upon land at Leghorn that has been acquired for this purpose.

The Italian Navy provides additional pay for officers and men who perform duty as aviators.



PLAN OF THE "CONTE DI CAVOUR."

The center turret is a triple gun turret, and not a twin gun turret as shown.

THE REVIEW.—The Italian Navy was reviewed by the King on his birthday, November 11, 1912. The fleet participating consisted of 12 battleships, 4 destroyers and 15 high-sea torpedo-boats. The new cruiser *Quarto* escorted the five torpedo-boats that made the famous raid in the Dardanelles. The King delivered the flags to these boats.

JAPAN.

VESSELS BUILDING.

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Fuso	30,000	22.5	10 14-in., 16 6-in.	Kure	Laid down March 11, 1912
Battle-Cruisers					
Kongo	27,500	27	8 14-in., 16 6-in., 8 t. t.	Vickers	Launched May 18, 1912
Hiyei	27,500	27	same	Yokosuka	" Nov. 21, 1912
Haruna	27,500	27	same	Nagasaki	Keel laid Mar. 16, 1912
Kirishima	27,500	27	same	Kobe	" " Mar. 17, 1912

"HIYEI."—This vessel is said to be 704 feet long, 92 feet beam, and to have sixteen 3-inch guns in addition to the ones given above.

A new classification of the Japanese fleet was published in September:

1. Battleships.
2. Battle-cruisers.
3. First-class cruisers over 7000 tons displacement.
4. Second-class cruisers under 7000 tons.
5. Coast defenders, first-class, over 7000 tons.
6. Coast defenders, second-class, under 7000 tons.
7. First-class gunboats over 800 tons.
8. Second-class gunboats under 800 tons.
9. Destroyers:
   - First-class, over 1000 tons.
   - Second-class, from 600 to 1000 tons.
   - Third-class, under 600 tons.
10. Torpedo-boats:
    - First-class, those over 120 tons.
    - Second-class, those under 120 tons.
11. Submarines.

Of the ships captured from Russia the *Hizen*—ex *Retwisan*—is the only one that is regarded as an efficient battleship; all the others are classed as first-class coast defenders.

The modern heavily armed armored cruisers are now designated as battle-cruisers. The *Chihaya, Yodo* and *Mogami*, formerly classed as avisos, are now classified as first-class gunboats.

The *Toyohashi, Karasaki, Manshu* and *Matsue*, which were formerly merchant steamers, are no longer classed as auxiliaries, but as regular war-ships under the category of old cruisers as second-class coast-defence ships.

Japan has contracted to have two submarines built in France and two destroyers in England that shall serve as models by which they will build similar vessels in Japan.

THE SCOUT CRUISERS.—With the commissioning of the *Yahagi* in the fall of 1912, the three protected high-speed cruisers building have entered the service. The others were the *Chikuma* and *Hirado*. The illustration of the later shows a vessel with a pronounced clipper bow, though she is in general appearance similar to the German *Breslaus* and the English *Southamptons*. The masts are exceptionally lofty with sheltered crow's nests. These cruisers are 465 feet over all, 46.5 feet beam, with a draft of 16.5 feet and displacement of 4950 tons. The *Chikuma* has Parsons' turbines, the other two Curtis. Miyabara boilers are fitted in all. They have a protective deck 3 to 2 inches thick and a 4-inch conning-tower. The speeds actually made are not known, the contract speed being 26 knots.

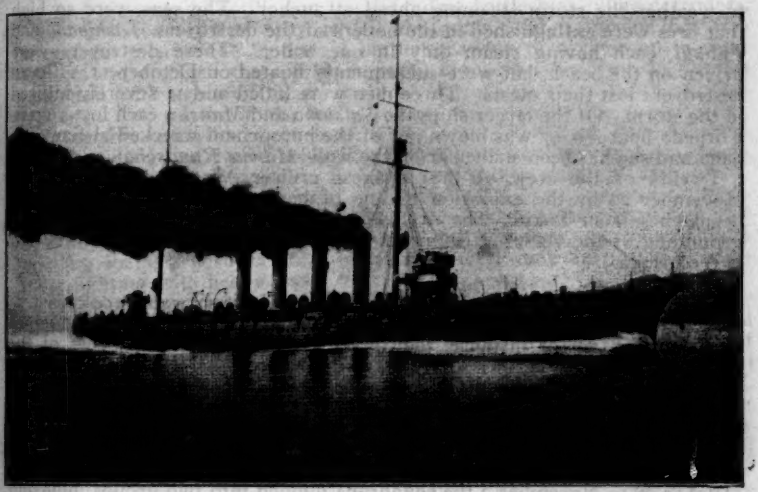
A comparison of the three classes as to displacement, designed speed and armament follows. The *Breslau* and her sisters have made from 28 to 30 knots.

Vessel	Displacement	Speed	Armament
		knots.	
Hirado	5,000	26	6 6-in., 8 3-in., 3 18-in. t. t.
Breslau	5,000	28	12 4-in., 2 t. t.
Southampton	5,500	25.5	8 6-in., 4 3-pdrs., 2 21-in. t. t.

DOCKYARDS.—Japan has five first-class naval ports, viz.: Yokosuka, Kure, Sasebo, Maizuru and Port Arthur. There are two second-class naval ports —Ominato and Bako—and three third-class naval ports—Takeshiki, Chinkai and Eiko—which have small detachments for defence.

The Japanese Government has published a statement showing its naval expenditure during the Chino-Japanese and the Russo-Japanese Wars. The first of these wars lasted 283 days and the aggregate displacement of the ships employed, including torpedo-boats, was 62,818 tons; the average cost per day was 54 cents per ton. The second war lasted 614 days, and the aggregate displacement of the ships employed, including torpedo-boats, was 283,196 tons; the average cost per ton per day was 30 cents.

BUDGET.—To reduce taxes the proposed Japanese shipbuilding program has been considerably curtailed. Instead of the announced program of building seven battleships and six armored cruisers of which two should be laid down annually, it is now proposed to build three new dreadnoughts and complete those building in the course of the next five years. The ships now building consist of one battleship and three armored cruisers, so that at the end of five years—1918—the nucleus of the fleet will consist of four of the most modern battleships, the *Fuso* and three sisters, four battleships, *Kawachi* and *Satsuma* class, and four modern armored cruisers.



THE NEW CRUISER "HIRADO."

Below is a tabular record of the naval budgets for the various years:

	Millions.		Millions.
1901–02	114	1907–08	400
1902–03	94	1908–09	396
1903–04	94	1909–10	187
1904–05	55	1910–11	196
1905–06	61	1911–12	225
1906–07	161	1912–13	240

PERSONNEL.—Naval cadets hereafter enter the Japanese naval school on July 1 and on August 1 they cruise in sea-going school ships to become familiar with service conditions. After a cruise of four months they begin the course of studies in the naval school for three years. After completing the three years course at the naval school they are required to pass examinations for ensigns and then serve afloat.

In February a change in the ministry took place, Count Yamamoto becoming Premier, and Admiral Saito, the Secretary of the Navy. It is possible that this will result in greater expenditures for the navy. Admiral Togo has been given a rank in the nobility, and Vice-Admirals Uryu and Saito have been promoted to admirals.

AVIATION.—The Japanese are eagerly developing aviation in the Japanese Navy. They practiced with aeroplanes in the naval maneuvers and have established an aviation school in which an American, W. B. Atwater, has been appointed an instructor in aviation. The German airship *Parseval* was accepted in Japan in April. The Japanese also purchased American and French aeroplanes of various types. The naval maneuvers were marked by use of Curtiss and Farman hydroplanes.

ACCIDENTS.—A typhoon on September 22 and 23 caused considerable damage to the Japanese fleet in Ise Bay. Destroyers and torpedo-boats suffered most. Upon the approach of the storm the torpedo craft steamed out and anchored about three miles further from the beach and endeavored to weather the storm steaming ahead at anchor. The seas were so high that fires were extinguished in the boilers of the destroyers, *Tashibana* and *Fubuki*, each having steam only in one boiler. These destroyers were driven on the beach, but were subsequently floated on October 11. Eleven destroyers lost their masts. Three men were killed and 11 severely injured in the storm. Of the larger ships the *Satsuma* and *Manshu* each lost a mast. Torpedo-boat *No. 47* was blown out of the harbor and wrecked at Sauvigabana and she has been striken from the list.—*Marine Rundschau.*

Twenty of the crew of the Japanese cruiser *Nisshin* were killed on November 20 by the explosion of one of her boilers, according to press despatches from Tokio. The explosion is said to have been caused by the grounding of the vessel at Shimoda. The bodies of the dead were landed at Yokosuga.

THE MANEUVERS.—Every vessel having any military value took part as well as the new ships not as yet placed in the fleet or whose trials have not been finished, as for instance, the *Settsu* and the 5000-ton cruisers of the *Hirado* type.

The maneuvers began on October 21 and ended November 12 by a grand review before the Emperor off Yokohama. Admiral Dewa commanded the green fleet or enemy, and Vice-Admiral Yoshimatsu the red fleet or home force.

Each of the active and reserve squadrons concentrated at Sasebo. From October 28 to November 3 the squadrons divided into two groups, blue and red, the training of each being under the orders of its commander-in-chief, and search problems, and torpedo attacks took place.

From November 3 to 10 maneuvers as a whole took place.

The torpedo attacks, lights masked, on the battleships with nets down, the torpedoes being actually fired, are worthy of remark. "Ten torpedoes were found in the nets of the *Katori*, an incident which proves their utility and necessity."

The problem of the last part of the maneuvers assumed that the blue squadron coming from the south had conquered the islands of Kiushu and Shikoku, and were steaming towards Tokio Bay.

The idea was that this attacking force proceeding from the west should endeavor to break through the home squadron and land a force near enough to the capital to endanger it. The blue or invading squadron was under the command of Admiral Dewa, and consisted of the battleships *Kawachi, Settsu, Aki, Satsuma, Katori* and *Kashima*, with four armored cruisers, five second-class cruisers, and two destroyer flotillas. The red or defending force was commanded by Admiral Yoshimatsu, and consisted principally of the battleships *Asahi, Fuji, Mikasa* and *Shikishima*, with the four new armored cruisers *Ibuki, Ikoma, Kurama* and *Tsukuba*, four smaller

cruisers with despatch boats, destroyers and submarines. The port of Sasebo was allotted as the base of the invading force, whilst the defenders had the naval station at Yokosuga.

The opposing forces first came into contact on the 6th, when the blues were picked up by the 6th squadron, stationed at Ise Bay. The news was at once wirelessed back to the main fleet, whilst the scouts fell back slowly, exchanging long distance shots with the invaders. The scouting squadron joined forces the same afternoon with the cruiser squadron, consisting of the *Ikuma, Ibuki* and four other vessels, under command of Admiral Yamashita. In the meantime the main battle fleet, which had been moving up from the Bonins, on receipt of the news that the enemy had been found, came on to Izu, where the larger vessels of the defending force united, leaving the enemy to be watched throughout the night by the destroyers and smaller cruisers. It was doubtful whether the enemy would attempt to break right through by main force, which would give them more time in case of failure, or whether they would elect to try and slip through nearer the Bonins and come on Tokio from the south. The former plan was adopted, and at midnight of the 6th Admiral Dewa launched his torpedo flotillas on the defending battleships. The defenders, however, discovered the approach of the gnats, and a furious fire was directed on them. The blue main battle squadron then came up to their support, and engaged the red main fleet. On both sides torpedo flotillas were used with great effect, not only in long-distance raids, but at close quarters. Two of the boats, in fact, were badly damaged.

Whilst this battle had been in progress a detachment of the blue fleet, which the reds had failed to locate, had slipped round Boshu, intending to force the entrance of Tokio Bay. The maneuver, however, failed, for the Yokosuga defence squadron, under Admiral Uryu, discovered them at dawn, and with the assistance of the reserve torpedo flotillas, which had moved up in the trail of the main fleet from the Bonins, succeeded in surrounding them, a position from which they were only extricated by desperate fighting with heavy loss.

It is stated that the submarines of the Yokosuga squadron proved extremely handy and did a lot of good work. After this by-battle Admiral Uryu, leaving a small force at the entrance of the bay, moved up the coast to the assistance of his commander-in-chief, but by the time of his arrival the chief umpire had ordered the "cease fire," and the two forces drew off, the victory remaining decisively with the defenders. For the subsequent two days further operations were conducted having the same objective in view, but at no time did the reds have any difficulty in locating the invading forces and in holding them off, although no other big battle took place.

It will be noticed that whereas the invading force had the benefit of the latest and most powerful units in the Japanese Navy, the defending force consisted for the most part of old vessels which had seen service in the Russian War, of captured and converted cruisers of the same period, and coast-defence vessels. The invaders had the advantage in guns and numbers, but the defenders had one squadron of fast cruisers, as well as the submarine division.

NORWAY.

An order has been placed with Messrs. Armstrong, of Newcastle, for a small coast-service battleship for the Norwegian Government. This is one of the two ships which have been provided for this year, together with some submarines. Like all the battleships of the small nations of northern Europe, she will be of small displacement. On a tonnage of 3400, which is rather less than that of the four coast-defence vessels already completed for Norway, she will carry two 9.4-inch guns, four 6-inch, and a number of smaller weapons, together with two 18-inch torpedo-tubes. Her engines are to be constructed by Messrs. Hawthorn, Leslie & Co., to give a speed of 16.5 knots. The protection will consist of a water-line belt, 7½ inches

thick, and the usual thin protective deck. All the previous Norwegian battleships were built at Elswick, so that this vessel is the fifth to be constructed for Norway by Armstrongs. Four submarines have been undertaken by the Germania Yard, Kiel, and it is proposed to bring up the strength in these craft to twelve, this firm being likely to obtain the orders. —*Naval and Military Record.*

The personnel strength is 1713 men. The government is preparing a new project to provide 6 armored cruisers, 6 destroyers, 40 torpedo-boats and 12 submarines.

PERU.

The armored cruiser *Commandante Aguirre* (formerly the French ship *Dupuy de Lome*) has arrived in Peru with the destroyer *Teniente Rodrigues* built by Schneider Creusot. She has a displacement of 500 tons and is fitted with Zoelly turbines. The submarine *Ferre* of 440 tons, built at Creusot, has been taken to Peru and delivered by the transport steamer *Kangaroo*. Another submarine, the *Palacios*, is being built for Peru in France.

PORTUGAL.

Portugal has provided for a fleet of 3 battleships of 21,500 tons, 2 cruisers of 2500 tons, 10 destroyers of 890 tons for the sea-going fleet with 6 destroyers of 890 tons and 5 submarines for coast defence, besides a submarine docking ship, 2 tugs, 1 surveying ship, 3 school ships and 1 mine layer. The personnel strength, 1912, was 4900.

RUSSIA.

VESSELS BUILDING.

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Sevastopol	23,300	23	12 12-in., 16 4.7-in.	Baltic Works	Launched June 29, 1911
Petropavlovsk.	23,300	23	same	" "	" Sept. 9, 1911
Poltava.....	23,300	23	same	New Admiralty	" July 10, 1911
Gangut	23,300	23	same	" "	" Oct. 7, 1911
Emperor Alexander III	22,860	21	12 12-in., 20 4.7-in.	Ivan Bunge Co.	" July 24, 1912
Empress Marie	22,860	21	same	" " "	Laid down Oct. 30, 1912
Catherine II...	22,860	21	same	Nikolaieff	" " Oct. 1, 1912
Battle Cruisers					
Ismailia.....	28,000	27	9 14-in., 20 4.7-in.	Galerni	" " Dec. 20, 1912
Kinburn.....	28,000	27	same	Baltic Works	same
Borodino.....	28,000	27	same	Galerni	same
Navarino.....	28,000	27	same	Baltic Works	same

Russia is making dilatory progress with four 23,000-ton ships in the Baltic, and three other battleships of 22,500 for the Black Sea, which were begun in October, 1911, and are not expected to be ready until 1916. On December 19, at St. Petersburg, four battle-cruisers were laid down which form part of the comprehensive program which has been adopted for the immediate strengthening of the Baltic fleet. Of 30,000 tons, and armed with nine 14-inch guns, they will be capable of steaming at a speed of 27 knots, and will be amongst the most powerful and at the same time most expensive vessels yet laid down. Owing to the conditions existing in Russia, the cost of their construction will amount to 4½ millions sterling for each ship, which represents about £150 per ton. The names assigned to them are *Borodino, Navarino, Ismailia* and *Kinburn.*

The *Novik*, whose trials are discussed on page 1662 of Vol. 38 of the PROCEEDINGS, is now being adversely criticised. This destroyer of 1280 tons was paid for by a national subscription and built at the Putiloff shipyard. The plans of the hull, turbines and boilers were furnished by the Vulkan works of Stettin, and it was hoped to get a vessel thus that answered all requirements. It was a condition of the subscription that the vessel must be built in a Russian shipyard. After its trials it has been rejected by the Admiralty. The contract speed of 34 knots was not obtained by a large margin, and during the trials all the boilers were injured so that they will have to be replaced. Such clouds of smoke and torching were apparent that for this reason alone the vessel is not fit for the fleet. The vibrations of the hull were excessive. This case of the *Novik* shows that the Russian shipyards are not yet capable of the best work.—*International Revue.*

BUDGET.—Upon the Russian Navy during next year it is proposed to expend $122,500,000, which will include $37,000,000 for the new program, $9,600,000 for completing the four battleships of the *Gangut* class, $15,000,000 for the ships building for the Black Sea, and $5,000,000 for new plant and improvements at the Admiralty and Baltic yards, where four armored cruisers are now laid down for completion within four years.

RUSSIAN NAVAL SHIPBUILDING.—While it is the purpose to build all the new vessels for the Russian Navy in Russia, the two 4300-ton cruisers will be built by Schichau at Dantzig and shall be like the German small cruiser *Kolberg*, having Schichau turbines to give speed of 27.5 knots. The cost will be $1,750,000 each. They are to be used for training of stokers:

The Russian shipyards will build the following:

Four armored cruisers for the Baltic fleet will be built in the government shipyards, Admiralty and Baltic works. The keels of these armored cruisers were ordered to be laid in December, 1912, and they are to be completed within a period of four years. Total cost, each $12,500,000.

Two light cruisers, Baltic fleet, of 6500 tons, will be built at the Putiloff works, each to cost $4,750,000.

Two similar cruisers of 6500 tons to be built at Reval.

Two similar cruisers, Black Sea fleet, to be built at Nickolajeff.

Eight torpedo-boats to be built at Reval by Russian Company.

Six torpedo-boats to be built at St. Petersburg, Metalworks.

Eight torpedo-boats to be built at Reval by Lange-Becker.

Five torpedo-boats to be built at Reval by Ziese works.

Each of these boats will cost $1,000,000 except the five last-named that will cost $975,000.

Six submarines to be built at Baltic works.

Six submarines to be built at Reval, Nobel-Lessiner works.

RUSSIAN FLAG.—Owing to prevailing confusion about the Russian national colors a commission was appointed in 1910 to consider the subject and in May, 1912, they reported their decision.

1. The Russian Imperial national colors are black-yellow-white. These colors serve for the national flags, the imperial standard and broad pennants and will be used for flags of commanders-in-chief and diplomatic representatives abroad. These colors will be used for all army flags and all cockades, sashes, sword knots and shoulder knots will combine these colors black-yellow-white. All government property sentry boxes, etc., will be marked by these colors black-yellow-white.

2. The navy will continue to use the flag adopted by the founder in memorial of Peter the Great, a white flag with a blue St. Andrew's cross.

3. The white-blue-red flag, adopted by Peter the Great for the Russian merchant marine, will be allowed to fly on the vessels of inland waters and on those belonging to members of the imperial family. These colors may also be used by private citizens with the national colors black-yellow-white for decorative purposes.

The report of the commission essentially emphasized the Russian national colors and merely curtailed the use of the white-blue-red flag.—*Revue Internationale ueber der gesammten Armeen und Flotten.*

SECRECY ORDERS.—A press dispatch from St. Petersburg, December 23, announces the issue of an imperial decree forbidding the circulation of military or navy news of any kind whatsoever. The decree remains in force for a year. It gives in minute detail a list of matters which must not be touched upon, including the fulfillment of factory orders for the army or navy and relating to furloughs or calls to the colors.

SPAIN.

SHIPBUILDING.—The old program of 1908 is being carried out slowly, four gunboats and three torpedo-boats having been completed; and, in addition, a program for 1913 has been adopted which consists of three dreadnoughts of 21,000 tons each, two of the latest type of destroyers, nine torpedo-boats and three submarines.

All the vessels are to be constructed in Spanish shipyards. The work is to commence as soon as the battleship *Alfonso XIII* has been launched at Ferrol.

The personnel strength of the navy is 665 officers, and 9500 enlisted men and marines, the latter numbering 300.

The dates of completion of the three ships are as follows: *España*, 1913; *Alfonso XIII*, 1914; *Jaime I*, 1915-16. All are under construction at the New Ferrol dockyard.

THE "ESPAÑA."—The three battleships of the *España* class, the *España*, *Alfonso XIII* and *Jaime I*, now building in Spain, under the direction of the "Vickers-Elswick" syndicate, represent a type which might be classed as second-class dreadnoughts. The contract for their construction was secured in open competition for the best design within given limitations, the times of building to be four years, five and a half years and seven years respectively from the date of contract. During the first two years, 75 per cent of the workmen engaged were to be "foreign," and from then onwards only 50 per cent, the remainder being Spanish.

The type represents an interesting attempt to produce an all-big-gun ship upon moderate dimensions, the displacement being 15,700 tons, length (water-line) 439½ feet, beam 78¾ feet, and mean draft 26 feet. The armament consists of eight 12-inch 50-caliber guns in four twin turrets, and twenty 4-inch guns mounted in a main-deck battery, together with four smaller pieces and three submerged torpedo-tubes.

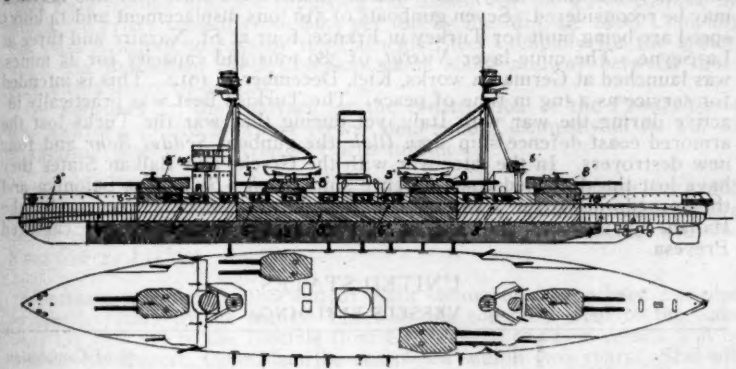
The four turrets are distributed after the *Indefatigable* style, the amidships couple being widely diagonal with extensive cross-deck arcs of fire, so that all eight guns can be trained on either beam. Their height above water is 25 feet, the mountings being protected by 10-inch bases, the gun-houses having a varying thickness of seven to eight inches.

As can be seen from the deck plan, the 4-inch guns are differently spaced on each side according to the position of the 12-inch guns, the two guns at either end being recessed to secure axial fire. The battery is lightly protected by a 3-inch armor wall and bulkheads—a thickness insufficient to keep out projectiles of any size, and just enough to burst shells so that the maximum effects will be felt in the battery. A better distribution would have been to have ranged the guns along a flying deck, as in the *Lord Nelson*, or in the superstructures and on the turret tops, where a higher command would have obtained, and their positions, being more isolated, would have been less likely to suffer *en masse* from the effects of a single shell.

The placing of a secondary battery is always a difficult problem to solve. Our own ships have had their 4-inch guns widely separated and usually unprotected, except in the case of the *King George V* class, where light case-

mates have been fitted, it being laid down that light guns will not be fought in a general action, and in any case will be wiped out if hit by a 12-inch projectile, so that the weight expenditure of light armor upon them is not justified. A thin casemate to each gun does not, of course, aggregate so much as a continuous armor wall, so that the total weight of the 4-inch gun protection in the *King Edward V* class is not a serious factor. But in the *España* it would seem that the fighting efficiency would be improved by leaving the 4-inch guns without armor, as in the latest American ships of the *Oklahoma* class, and increasing the protection on the water-line. This latter consists of an 8-inch belt amidships, tapering to 4 inches at the bow and stern; along the lower deck side the armor is 6 inches thick, and above is the battery. A 1½-inch protective deck encloses the vitals of the ship, while below the water-line the hull is covered with armor of similar thickness, the extent of which can be gathered from the plan.

There are two conning-towers, that forward being 10 inches, the one aft 6 inches thick.



PLAN OF THE SPANISH BATTLESHIP "ESPAÑA."

The machinery consists of four sets of Parsons' turbines actuating four screws, the horse-power being 15,500, and the designed speed 19.5 knots. Steam will be generated in Yarrow boilers, and coal to the extent of 900 tons normal and 1900 tons maximum represents her fuel capacity, giving a nominal radius of 5000 miles at 10 knots.

As regards the appearance of the ship, there is little to comment upon; the single funnel, tripod masts and lack of superstructure give her a distinctive profile easy to recognize, while the stowage of the boats upon the amidships turret-tops is unique in British practice.

Range control will be practised from thinly armored stations on the tripods, unless these are replaced by pole masts in the interim, and the range finders mounted on the conning-towers, as is being done in the newest British ships.

Owing to the deadwood aft being cut away, the *España* should prove a handy ship; forward the freeboard is 18 feet, the big guns being 25 feet above water, and the secondary pieces 14 feet, a height insufficient to assure their being fought in all weathers.—*Marine and Naval Architect.*

SWEDEN.

The action of the liberal government of Sweden in 1911 in ordering torpedo-boats and submarines to be built instead of the armored ship of 6800 tons that had been appropriated for, caused considerable excitement among the people who raised the sum of $4,500,000 by popular subscription to build an efficient armored ship. $3,750,000 of this subscription was available for this ship, but after long delay it was finally decided to build an armored ship to be named *Sverige* at Gotha works in Gothenburg. This

will have a displacement of 7100 tons and a speed of 22.5 knots with turbines. The armament will be four 11-inch 45-caliber guns, eight 6-inch of 50-caliber, six 3-inch and two torpedo-tubes. Armored belts will be 8 inches thick. Three submarines are being built in Swedish yards. Personnel strength is 5717.

TURKEY.

The two battleships ordered by Turkey to be built in 1911 are to have a displacement of 23,500 tons, and with about 500 tons less tonnage than the *King George V*, they will have the heavier intermediate battery of 6-inch guns. The armor will be lighter, however. The *Rechad V* was laid down at Elswick in December, 1911, and considerable progress on her has been made, but the work on her has now stopped. The other battleship, *Reshad-I-Hamis*, for which Armstrong contracted, has never been commenced. The Turks have once declined to consider the sale of these two proposed ships to some other navy, but Turkish finances are such that this decision may be reconsidered. Seven gunboats of 510 tons displacement and 14 knots speed are being built for Turkey in France, four at St. Nazaire and three at La Seyne. The mine layer *Nusrat*, of 380 tons and capacity for 25 mines, was launched at Germania works, Kiel, December 4, 1912. This is intended for service as a tug in time of peace. The Turkish fleet was practically inactive during the war with Italy, yet during that war the Turks lost the armored coast-defence ship *Awn Illah*, the gunboat *Seddul Bahr* and four new destroyers. In the later war with the Greeks and Balkan States they have lost the disarmed coast-defence ship *Fetch-i-Bulend* at Salonika and the torpedo-destroyer *Anatalia* which had been sunk at Prevesa by the Italian Navy and which was raised by the Greeks when they captured Prevesa.

UNITED STATES.

VESSELS BUILDING.

Number	Name	Displacement	Speed	Armament	Where Building	% of Completion		
						Dec. 1	Jan. 1	Feb. 1
	Battleships							
34	New York	27,000	21	10 14-in., 21 5-in.	N. Y. Navy Yard	61.6	63.9	66.3
35	Texas	27,000	21	same	Newport News	78.2	80.4	81.4
36	Nevada	27,500	20.5	10 14-in., 21 5-in.	Quincy	3.0	4.3	5.9
37	Oklahoma	27,500	20.5	same	Camden	4.9	6.2	7.8
38	Pennsylvania	31,000	21	12 14-in., 22 5-in.				

U. S. S. "PENNSYLVANIA."—This vessel was authorized by act of Congress approved August 22, 1912. The limit of cost, exclusive of armor and armament, is $7,425,000. This is the largest battleship yet designed for the United States Navy, and so far as known, is the largest that has been designed for any navy. The plans contemplate a vessel of the following dimensions:

Length on designer's water line	600 feet
Length over all	608 feet
Breadth	97 ft. ½ in.
Draft	28 ft. 10 in.
Displacement	31,400 tons
Speed on 4-hour trial	21 knots
Heavy battery	12 14-in. guns
	4 submerged t. t.
Supported by a torpedo defence battery of	22 5-in. guns

The vessel will be heavily armored, and will be driven by reciprocating engines or turbines, as may be decided after the bids are received, and will be fitted with oil-burning boilers of the water-tube type.

The plans of this vessel were in the hands of prospective bidders on December 20, 1912, and the bids were opened at the Navy Department on February 18, 1913.

The lowest bid was submitted by the Newport News Shipbuilding Company, $7,235,000, providing for Curtis turbine engines. The same company submitted a number of other bids, based on variations of the type of engine, the highest being $7,295,000, for Parsons' turbine engines.

The next lowest bid was that of the Fore River Company, of Quincy, Mass., at $7,312,000, for Curtis turbine engines. Then in order came Cramp & Sons, of Philadelphia, at $7,349,000, for Parsons' turbine engines, and the New York Shipbuilding Company, at Camden, N. J., at $7,352,000, for Parsons' turbines. The speed of 21 knots was proposed by all builders. Bids were opened also for supplying the armor for the *Pennsylvania*, on which the prices ranged from $454 per ton by the Midvale Steel Company for class A armor to $455 by the Carnegie Steel Company for the armor, while the Bethlehem Steel Company came about midway between those bids with a figure of $454.65.

On February 27, the contract for the construction of the *Pennsylvania* was awarded to the Newport News Shipbuilding Company at its bid of $7,235,000, vessel to be driven by Curtis turbines.

OFFICERS' QUARTERS.—On vessels of the navy commencing with the *Nevada* class all officers' quarters will be located aft. In the English service the move from forward to aft has also been made commencing with the *King George V* class.

Contracts for the construction of eight submarines have been awarded by the Secretary of the Navy. Three of the contracts went to the Lake Boat Co. and five to the Electric Boat Co. One of the new vessels will be built at Bridgeport, Conn., and be completed within two years. She will be of about 565 tons displacement, and will cost $535,000. The same company will construct two of the same type, at the works of the Craig Shipbuilding Co., Long Beach, Cal., but at a greatly increased figure. Each vessel built in the west will cost $25,000 more than those built east. There has long been a 4 per cent allowance made for bidders from the west. The vessels to be built by the Electric Co. are all to be constructed at Quincy, Mass. One is to be of the *39 E* design, to be delivered within twenty-four months and to cost $615,000, and the others are to be of the *37 Ga* design, and are to be delivered within twenty-two, twenty-three, twenty-four and twenty-five months, respectively, and to cost $534,000 each.—*The Nautical Gazette.*

SPEED OF BATTLESHIPS.—The official records given in the report of the chief constructor show the *Florida* to be the fastest of our ships with a speed of 22.08, the *Delaware* next, 21.56, then the *Wyoming* with 21.22, the *Arkansas* with 21.05, and the *Utah* with 21.04.

ORDNANCE AND GUNNERY.

GUNS AND PROJECTILES.

FOUR-GUN TURRETS.—It now appears certain that they have been adopted for the *Bretagne* class of French dreadnoughts. What little is known relative to them is given in the description of this class of ships.

NEW GUN FOR GERMAN VESSELS.—A new gun of a larger caliber than the 12.5-inch gun is to be installed on the *Ersatz-Weissenburg, Er-Kurfurst-*

Friedrich-Wilhelm and *Kaiserin-Augusta*. Two models are under consideration, both of 50 calibers in length; the 14-inch weighing 69 tons and firing a 1364-pound projectile; and a 15-inch weighing 85 tons, firing a 1670-pound projectile. A gun of 16-inch caliber, firing a 2024-pound projectile, has already been built by the Krupps. Furthermore, each caliber is being designed in six models, for lengths of 40, 45 and 50 calibers. For each length there are two models, a light and a heavy gun, differing in weight of powder charges. The initial velocity ranges between 2624 and 3080 foot-seconds. The type adopted is the 50-caliber gun with 2950 foot-seconds initial velocity.—*Le Yacht.*

CALIBERS OF GUNS.—Germany and the United States have built guns of 14-inch caliber 45-calibers long as is the English 13.5-inch gun, with shells weighing 1360 to 1400 pounds. Their initial velocity is in the neighborhood of 2600 foot-seconds, the muzzle energy being no greater than in the guns of the *Orion*, the penetration at long ranges being the same. Now Krupp has a new model 14-inch 50-calibers long with an initial velocity of 2950 foot-seconds. England fearing lest she be left behind has designed for the *King George V* a 13.5-inch gun having a projectile of 1400 pounds and a muzzle velocity of 3017 foot-seconds. This is demanding a power in the larger caliber proportionally equal to that expected in the 12-inch.

Almost immediately there have resulted fractures of tubes and even the bursting of a gun. This has caused an adoption of a higher caliber for the *Warspite* class, that of a 15-inch gun with a shell weighing 1716 pounds. The proposed initial velocity is not known. The shell appears rather light for the increase in caliber. Accuracy at long ranges is sought for. The decisive range of action has in five years grown from 6000 to 10,000 yards.

The reduction from 10 guns to 8 guns in the *Warspite* class does not seem logical. The weight of the broadside has diminished in spite of the increase of caliber; the *Orion's* is 12,320 pounds, the *King George V's* is 13,970 pounds, the *Warspite's* is 13,728 pounds. Above all, however, in comparing value of gun fire its rapidity should be considered and if this 15-inch gun fires as rapidly as do the 12- and 13.5-inch guns there will only be 16 shells per minute in place of 20, a very considerable difference.

We consider the 12 guns of our *Normandies* better than the eight of the *Warspite's*.—Henri Bernay in *Le Yacht.*

GUN-CONTROL GEAR.—Recently we are reading much of the new control adopted in foreign services. *Engineering* says:

"The production of an efficient and compact infinitely variable hydraulic speed gear has been attempted by many engineers, but the difficulties surrounding the solution of this problem are not easily overcome. The chief troubles in this class of machine are the prevention of leakage of the working fluid from the active system, provision for taking up wear of the working parts, and the devising of a method of control easy to operate and positive in its action. As the result of considerable experiment, however, two well-known American engineers—Messrs. Harvey D. Williams and Reynold Janney—have devised a successful gear of this type, the machine being universally known to-day as the Williams-Janney hydraulic variable-speed gear," known in our service as the Waterbury Tool Company's or the variable-speed gear system of turret control. [Described p. 226 *et seq.* of *Naval Electrician's Text-Book.*]

"The first Williams-Janney gear was brought out in 1907, and although at that time it was far from being the perfected machine it now is, it was yet so far in advance of anything that had previously been devised that it was immediately adopted by the United States Navy for the control of gun-training gear. Since these early days many improvements have been made in the design, and it may now be considered as perfect and efficient a machine for transmitting power by hydraulic means as human ingenuity can devise. As evidence of its efficiency and reliability, it may be stated that not only has it been exclusively adopted by the American Navy, in the

ships of which alone many hundreds of machines are now in use, but it has also been supplied in large quantities for the operation of guns, and for a variety of other purposes, to such other of the large navies of the world as the Japanese, the French, and the Russian, as well as to smaller powers, the absolute uniformity of its motion at very low speeds and its infinite range of speeds being features which render it of unexampled value for the control of ordnance.

"As mentioned previously, this gear has been largely applied to the control of artillery, but it will be readily understood that a wide field for its adoption exists in industrial applications. For example, it has been successfully adopted for controlling the various motions on cranes, both of the floating and land type, in the former the propellers also being operated by its means. Other uses for which machines have been supplied include ships' boat-hoists, conveyors, printing presses, machine tools, railway swing-bridges, lifts, etc. It is, indeed, applicable to any purpose where a variation in speed is required, and the source of power may be any prime mover running at a constant speed and in one direction only.

"In some installations the pump unit alone is used in combination with either a single-acting or double-acting ram, such as may be found on an hydraulic elevator or lift. In other cases only the motor unit is used, the power being obtained from an hydraulic main, and in such instances water is the operating fluid. This latter form of installation has been supplied in large numbers to operate gun-turrets on board ships on which the hydraulic system is in vogue, and has been found to give complete satisfaction."

Le Yacht in its notes from Toulon reports that the battleships *Justice* and *Vérité* are having the Janney system of elevating and training fitted to their 8-inch guns for it permits training and elevating to be done as slowly or as quickly as one may wish. The Aubrey ammunition hoist is fitted. This allows the car to be placed wherever you desire by placing a pointer on a scale at that point, the liftman's work being made nearly automatic for him.

A CORRECTION.—Major Piorkowski, of the Fried. Krupp Co., has called the editor's attention to the fact that the legend for the cut appearing on page 1670 of the December, 1912, issue should read "A Krupp Anti-Air Craft Gun Mounted on a Field Carriage" instead of "Ehrhardt Gun."

TORPEDOES.

TORPEDO WARFARE, RUSSO-JAPANESE WAR.—The *Naval and Military Record* publishes extracts from "The History of the Naval War between Japan and Russia," published by the Japanese admiral staff and the following are the conclusions drawn as to the value of torpedoes.

The *Marine Rundschau* critic of this history attributes the failure of the torpedo in the war to the fact that on almost every occasion the Japanese boats made their attack independently, instead of following the sound tactical principle of making such assaults *en masse*. Proper observance of that principle entails the allocation of a special divisional boat, or preferably a small cruiser, whose commandant is responsible for the planning and direction of all operations by the boats under his control. For obvious reasons the cruiser has a far better chance of sighting and keeping in touch with an enemy. It can maintain its course and still keep a sharp lookout in weather which renders impossible any observation from the low-lying, wave-swept bridge of a destroyer. The divisional cruiser is, in short, the eye of the flotilla, and, in many respects, the brain as well. Had the Japanese been in a position to assign a cruiser to every subdivision, as is now the custom in the British Navy, the torpedo operations in the war with Russia would most probably have been far more brilliant and effective. In the German Navy each flotilla of 12 boats is controlled by its divisional leader, which is not, however, a cruiser, but a destroyer like the others. In war no doubt the same duty would be taken over by a cruiser, as Ger-

many will dispose of a large number of these vessels. The second circumstance which is held to have limited the effectiveness of torpedo attack in the war was the comparative smallness of all the boats taking part. The largest Japanese boat displaced 420 tons, the smallest 85 tons, and as luck would have it much of their work had to be done in very heavy weather. It would seem therefore that the modern disposition to build destroyers of 1000 tons and more rests on a thoroughly sound tactical principle.

Finally, in drawing conclusions from the Japanese operations one must bear in mind the enormous development of the torpedo within the last eight years. The range, speed, accuracy, and destructive power of the torpedo to-day are twice, if not thrice, as great as those of the torpedo as used in the war. Nevertheless, after taking this and other facts into consideration, and weighing the pros and cons of the matter, assisted by the voluminous evidence supplied by the Japanese admiral staff, it is apparent that the efficacy of the torpedo has been somewhat over-rated. There is at all events not enough evidence of its powers to justify its promotion above the rank of auxiliary in naval operations. With the perfection of the sea-going submarine the torpedo may assume more formidable proportions, but under present conditions those nations which pin their faith to the torpedo as a means of substantially reducing the big ship preponderance of an opponent in the first stage of war are not improbably exposing themselves to bitter disappointment.

TARGET PRACTICE.

UNITED STATES.

The standing of United States vessels in the elementary target practice, in autumn of 1912, was:

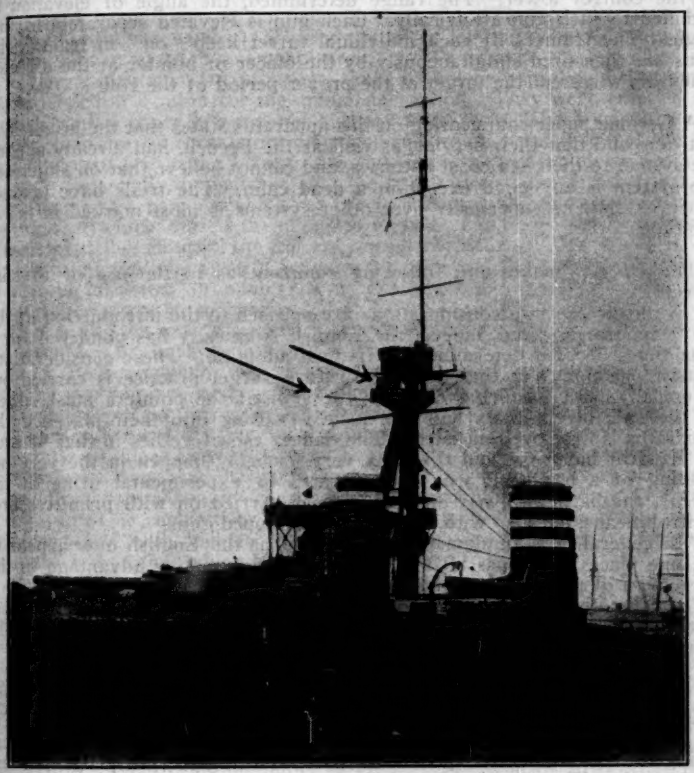
BATTLESHIP CLASS			TORPEDO CLASS			SUBMARINES		
	Vessel	Final Merit		Vessel	Final Merit		Vessel	Final Merit
1	Delaware	46.026	1	Terry	74.133	1	C-2	50.000
2	Florida	43.184	2	Dale	73.796	1	C-4	50.000
3	Idaho	42.555	3	Decatur	64.306	1	D-2	50.000
* 4	Michigan	38.051	4	Perry	63.703	4	A-7	33.333
5	Connecticut	34.811	5	Preston	60.680	5	A-2	20.000
6	Louisiana	34.665	6	Ammen	59.144	5	D-1	20.000
† 7	Missouri	33.875	7	Stewart	57.241	5	E-1	20.000
* 8	New Hampshire	33.708	8	Whipple	56.464	8	A-6	16.667
9	Utah	30.997	9	Truxton	54.429	9	D-3	15.000
10	Rhode Island	30.383	10	Roe	54.308	10	C-5	10.000
*11	North Dakota	27.979	11	Burrows	54.289	11	A-4	0.000
*12	Virginia	27.957	12	Monaghan	53.441	11	C-3	0.000
13	New Jersey	22.424	13	Patterson	45.458	11	E-2	0.000
14	Kansas	22.358	14	Walke	45.196			
†15	Maryland	22.138	15	Flusser	44.580			
†16	Colorado	21.580	15	Perkins	44.580			
*17	Minnesota	21.300	17	Chauncey	42.105			
†18	Ohio	20.758	18	Trippe	38.443			
*19	South Carolina	19.056	19	Sterett	38.110			
20	Nebraska	17.248	20	Hull	31.696			
†21	Saratoga	16.656	21	Smith	31.075			
*22	Vermont	15.635	22	McCall	30.213			
†23	California	15.466	23	Lamson	29.868			
*24	Georgia	12.019	24	Jenkins	27.652			
			25	Drayton	26.140			
			26	Paul Jones	25.184			
			27	Reid	22.611			
			28	Jouett	16.495			
			29	Barry	14.608			
			30	Preble	13.355			
			31	Paulding	2.167			

* Did not fire torpedoes.
† No torpedoes on board.

GERMANY.—The result of prize-firing in 1911-12 is now announced, and it is interesting to note that two of the four prize-winning vessels are all-big-gun ships, viz., *Nassau* and *Moltke*. The *Nassau* is first on the list, followed by the pre-dreadnought *Lothringen* (second squadron), the battle-cruiser *Moltke*, and the small cruiser *Dresden* (both of the first cruiser squadron).

FIRE CONTROL.

THE SCOTT FIRE DIRECTOR.—The First Lord of the British Admiralty proposes to fit this device to all armored ships at an expense of $2,420,000,



LOCATION OF THE MASTER DIRECTOR ON THE "THUNDERER" IS SHOWN BY THE UPPER ARROW. LOWER ARROW SHOWS LOCATION OF ITS APPARATUS.

including the altering of the funnels on four new vessels. This and the fact that the King conferred a baronetcy on Sir Percy Scott leave no doubt as to the success of the system.

From the various reports of the instrument which are all rather indefinite we cull a few facts.

It is certain that the rough weather tests were the most successful and that the *Thunderer*, commanded by Captain H. F. Oliver, R. N., made five times as many hits as the *Orion* did under precisely similar circumstances, and that the *Thunderer's* broadsides were delivered in record-breaking time

for heavy guns—13.5-inch—some 20 seconds between the salvos, which consisted of four salvos of five guns each and of three salvos of ten guns each.

Fifty shots were thus fired at 10,000 yards range while rolling over five degrees—actual average roll was a total of thirteen degrees, six one side to seven the other—and there were found on the target *forty-one* direct hits, or *82 per cent.* The best previous records were the *Thunderer's* first off Berehaven of thirty-seven hits out of fifty, or 74 per cent, and the *Orion's* twenty-four hits out of thirty, or 80 per cent, but at 6500 yards only, made in May.

The central or master station for the director may be in a top, a turret, or the control tower. The range determined, the angle of elevation is signaled to each gun electrically. Each gun is elevated separately to this angle. The trainers of each individual turret keep "on" in train. The guns are then fired simultaneously by the officer or pointer at the director when his wires cut the target at the proper period of the roll.

A German paper commenting on this apparatus states that the principle is not new and that their service, as well as the French, had already applied the system to their sea-coast batteries, and cannot believe that on shipboard the system is any good except in a dead calm. The trials have proved, however, that its superiority over other systems is most marked in heavy weather.

The *Uberall* makes the following comment as to the use of the fire director:

"Naturally, certain considerations are opposed to the introduction of the Scott apparatus. And, indeed, the English Admiralty has pondered for a long time before it determined on its final adoption. These considerations consist principally in that, if in the future, target practice is carried out principally with the firing director, the skill of the pointers must suffer. In the end, the pointers will still have to spring into their places if the apparatus is destroyed in battle. The danger therefore lies in that, if such an accident happens (and this may very probably happen in the very beginning of a battle, as was demonstrated by experimental firing at the *Hero*), the battle will not only have to be carried on with primitive fire-control means, but also with incompletely equipped guns.

"In general, it is fundamentally wrong, if as the English now appear to do, one places his hopes all too much on a presumptive advantage in the perfection of the technical aids, so easily injured in battle.

"On the other hand it would of course be wrong if one ceased endeavors to try all technical innovations as to their usefulness."—Translated from the German by E. L. G.

POWDER.

FRENCH POWDER.—There seems to have been but little actual advance in its manufacture save that the raw material is purchased under more stringent regulations. Experiments with a nitroglycerine propellant are being made. The agitation to reduce the monopoly of manufacture and the improved inspection service are having some good results.

Ever since the cartridge explosions in the *Michelet* (June last), and the subsequent discoveries made as to the unreliability of the naval powder, French gunnery specialists have been at pains, whilst improving the quality of their propellant, to minimize, by means of various devices, the risks of backflares and explosions during firing practice. The interesting experiments just made in the cruiser *Pothnau* under the supervision of Captain Schwerer, showing that these commendable efforts have been crowned with success, will go a long way to restore the confidence of French crews in their weapons. No accident or incident occurred, although no less than 800 consecutive full-charge rounds were fired in four hours from two 138-mm. guns. The heat developed, which was very great in the weapon firing under ordinary conditions, was considerably reduced in the other

gun, which, after each round, was cooled by a spray of cold water. This latter process, though it interferes with the rate of fire, already so low in the French Navy, has every chance of being adopted during practice under peace conditions, and, coupled with the use of safer powder, will, it is expected, once for all dispel the fears that have too long paralyzed war preparation.

The powder question was discussed by the Chamber of Deputies during its sessions on January 28 and 30, as well as on February 3, 4 and 6.

M. Lefèvre remarked that he had made inspection trips to factories and vessels. On the *Liberté* six tanks of 8-inch powder had been kept in the handling room for *fourteen* days where the temperature was estimated—no record being kept—at 40 to 42 decrees C. (These tanks were then replaced in the magazines.) The rule required landing all powders exposed *fifteen* days or more to a temperature of 35° C. or over. A few days later the *Liberté* blew up. In 1910, some tanks of powder—probably the same—were landed at Toulon for the annual inspection. They were emptied and relined with a paper in a manner authorized in 1909. These were the only tanks on the vessel containing this paper and we all remember that the first indications of fire on the *Liberté* were burning bits of paper blown from the hoists. Personally, he believed that the true cause of the disaster was the burning of this powder which set fire to inflammable matter, the heat of burning of which caused the shells to explode. If there had been less of this combustible material the *Liberté* would still be afloat. He was very firm in his belief that the type of powder was the correct one and quoted the numerous disasters in navies using nitroglycerine powders. The navy should refrigerate its magazines.

M. Baudin, the new Minister of Marine, explained the difficulties of this proposal, but M. Lefèvre said others had done it and the French could.

M. Lefèvre spoke of the mixed material used for the cellulose and favored strict homogeneity with the best cottons obtainable.

M. Danielon said that in the ends of economy—the economy that has cost two battleships and the lives of 1200 men—most any old material has been taken for cellulose provided its price was low. And the washings given this material were made with the dirty waters of brooks, or, as at Angoulême, with waters heavily charged with bicarbonate of soda. The amyl alcohol must be replaced by diphenylamine, but if we still use only cotton waste washed with impure water, the new powder will inspire no more confidence than that which blew up the *Liberté*.

M. Margaine stated that by making the great chemist of France an administrator—in place of increasing his salary—and keeping his ability on powder—an error was committed. This was shown in the adoption of an inferior method of "radoubage"—reworking, and of the "remalaxage" blending, both combining in a manner detrimental to the product. Other chemists dared not criticize their superior because it meant the loss of their positions.

M. Painlevé stated that for several years there has been a dispute between the Powder Commission at Versailles and the central laboratory of powders and saltpeters as to the possibility of spontaneous ignition of powder B or in fact any nitrocellulose powder. If this laboratory believes that such cannot be produced it is because they do not expose it to proper conditions. M. Gaudin states that temperatures and moisture are all that are necessary. M. Daniel Berthelot is cited as having declared in a recent conference that the spontaneous ignition of powder B is an uncontested fact, and that the conditions for this are closely defined.

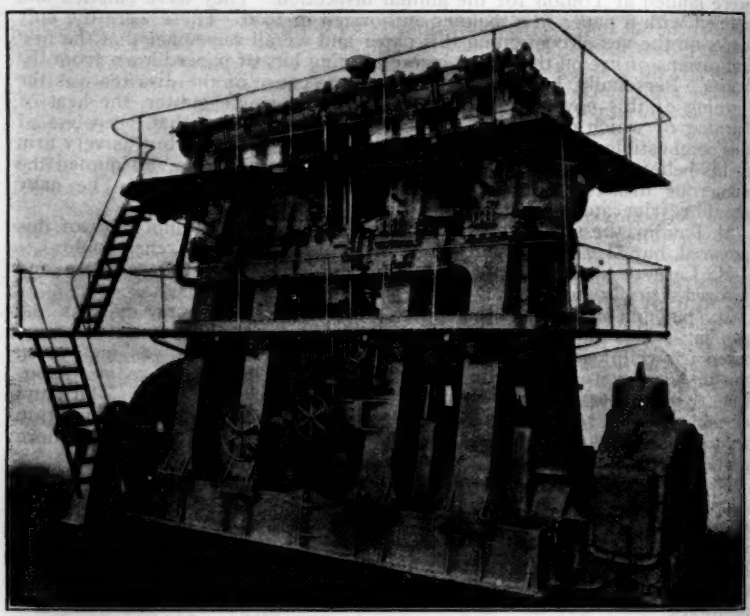
M. Bénazet criticized the manner in which charges were prepared for use at Toulon.

MARINE ENGINEERING.

In 1912 the horse-power of warships increased threefold for double the displacement. It is claimed that the turbine has advanced in favor to such an extent that one-third the total horse-power on shipboard is now furnished by this means.

OIL ENGINE IN 1912.—There is a general increase of confidence in the engines. The *Selandia* and the *Jutlandia* are the only large ships fitted with oil engines that have been tested on long trips.

The maximum power in use for any one ship is 2500 horse-power. There are in this ship eight cylinders working on the four-stroke-cycle principle, the diameter being 20⅞ inches, the stroke 28¾ inches and the revolutions 140 per minute. The power per cylinder is under 160. Experimental cylinders up to 2000 horse-power per cylinder are being built.



Engineering

800 HORSE-POWER ENGINE ON THE SINGLE-SCREW MOTOR SHIP "EAVESTONE."

DIESEL MARINE ENGINES OF 24,000 HORSE-POWER.—It is authoritatively stated that the German Navy is having constructed a twin-screw Diesel marine engine, which will consist of two sets of six-cylinder, double-acting engines, each set giving 12,000 horse-power, or 2000 horse-power per cylinder. These are intended for the *Ersatz Irene*, a cruiser of 4700 tons, now building at Weser.

As being of interest, indicating the general appearance of a large oil engine, an illustration of that of the *Eavestone* is given above. The *Eavestone* is the first large English built and owned Diesel-engined ship. She made her first voyage across the Atlantic, making 3,701 knots in 18 days and 18 hours, consuming a total of 73 tons of oil fuel. She is 4,500 tons displacement, 276 feet long, and 40 feet wide, designed speed 9.5 knots.

ENGINEERING PROGRESS IN THE U. S. NAVY, by Captain G. W. Dyson, U. S. N. Paper read at the Naval Architects' Meeting, November 21, 1912. —The author reviewed the Navy Department's work in investigating the relative merits of turbines and reciprocating engines, adopting oil fuel for battleships and destroyers and the improvement in turbines and reciprocating engines. The Parsons' turbine as it exists in United States vessels to-day is, with very few exceptions, the same as the turbines of this type which were fitted in the initial turbine vessel, the *Chester*. The only improvements which have been made consist of changes in blade angles, particularly in the low-pressure stages, an increase in the number of rows of blades in these same stages, and the fitting of nozzles for the admission of auxiliary exhaust steam at several different locations along the steam path. With the impulse turbine, however, the advance over the original naval turbines of this type, those of the scout *Salem*, has been rapid. The number of stages has been very much increased, both in battleship and in destroyer turbines, a drum construction has been adopted for the lower-pressure stages, steam balance for propeller thrusts has been provided, cruising nozzles for low fractional powers have been fitted, and nozzles for utilization of auxiliary exhaust are now supplied as in the Parsons' turbines. These changes in turbines of the impulse type have been accompanied by increase in economy. As regards reciprocating engines, increased economy and reduction in weight have been accomplished by adopting the following methods: Increase in steam pressure at engine, change in design of engine framing, increase in piston speed, use of superheat, but to a small degree only, reduction of clearances in cylinders, decrease of frictional losses through steam ports, positive circulation of steam through steam jackets, reduced back pressure in low-pressure cylinders, increased ratio between low-pressure and high-pressure cylinders, with consequent increased ratio of expansion of steam, application of forced lubrication to all journals, crosshead guides, eccentrics and thrust bearings. Also the following improvements, both with reciprocating engines and with turbines, have been made: Improved condensing apparatus resulting in higher vacuum, rational designs of feed heaters based upon amount of water to be heated and amount of auxiliary exhaust steam available for heating purposes instead of using the old rule of thumb of allowing a fixed number of horse-powers per square foot of heating surface, basing steam-pipe design upon actual rate of flow of steam through the pipes as determined by tests in service, reduction of feed-pipe losses to a minimum, improved evaporators and other auxiliaries. In addition to the above, the reliability of the machinery plant has been improved by: Adoption of high-speed, electric-driven forced-draft fans for battleships, turbine-driven forced-draft fans for destroyers, and the most important of all, the adoption of oil fuel for both battleships and destroyers. Considering the above changes in detail, the steam pressures at the main engines since 1895 have been increased gradually from 150 pounds per gage to 265 pounds per gage in the high-pressure valve chest, resulting in decreased size of engine cylinders and in decreased size of steam piping for equal units of power.—*Shipping*, Illustrated.

MACHINERY OF THE "RIO DE JANEIRO."—The *Rio de Janeiro* differs in the type of machinery adopted from her two Brazilian predecessors. These vessels had reciprocating engines, which gave a high efficiency on the trials. The new ship is fitted with Parsons' turbines, driving four shafts, each with one propeller, while the boilers are located in three rooms, two forward and one aft. The auxiliary machinery room, as well as two magazines, separate the second and third boiler holds. The machinery has been constructed by Messrs. Vickers, Limited, of Barrow-in-Furness. The designed power is 32,000 shaft horse-power, which it is anticipated will give a speed of 22 knots. The boilers, which are of the Babcock & Wilcox type, twenty-two in number, are arranged to work with oil fuel as well as coal. The coal bunkers are arranged on each side of the ship within the outer screen, and the capacity arranged for in the normal draft condition is 1500 tons, and at

full-load condition 3000 tons, while 500 tons of oil fuel is carried in the double bottoms.

The main propelling machinery, which is placed in three separate water-tight compartments, includes one high-pressure ahead and one high-pressure astern turbine in each wing engine room, and two low-pressure ahead turbines, in which is incorporated the low-pressure astern turbine, in one engine room in the center of the ship, between the wing engine compartments.

The turbines are designed to develop at least 32,000 shaft horse-power when working with a steam pressure of 170 pounds per square inch and at about 320 revolutions per minute.

The high-pressure and low-pressure turbines, for ahead and astern working, are arranged respectively to work in series, and all four shafts are available for working ahead and astern, the power being divided equally between the four shafts.

The high-pressure rotor-drums are 67 inches in diameter, and the low-pressure 112 inches; the height of blading varies from 5/8 inch in the cruising section of the high-pressure turbines to 12 inches in the low-pressure turbines. The rotor-drums, wheels, connecting-rings, and spindles are of forged steel, in accordance with the latest practice of the British Admiralty.

The turbines are connected to the propellers by hollow forged-steel shafting, 11¾ inches in external diameter. The propellers are of bronze, 9 feet 6 inches in diameter and 8 feet 9 inches pitch, three bladed, the driving faces being planed accurately to pitch. The propeller shafts are 12¾ inches in external diameter and 7¾ inches in internal diameter, sheathed with gun-metal in the way of the stern-tube bearings and strut bearings. Forced lubrication is supplied to the turbine and line-shafting bearings by six direct-acting pumps, the usual apparatus being fitted for cooling the oil.

The main condensers, two in number, having a combined cooling surface of 32,000 square feet, are placed at the aft end of the center engine room; they are of the Wier "Uniflux" type, designed for maintaining a high vacuum in tropical climates.

Centrifugal circulating pumps of large capacity, and air pumps, are fitted in duplicate in the center engine room, and an auxiliary condenser, with its centrifugal circulating and air pumps, is placed in each wing engine room.

For the purpose of overhauling the turbine casings, exhaust bends, and rotors, electrically driven travelling cranes are fitted over each set of turbines, and electrically driven turning gear is fitted to each line of shafting.

The boilers are arranged in three separate water-tight compartments, the No. 2 and No. 3 boiler rooms each containing eight boilers, and the forward, or No. 1, compartment, six boilers. The boilers are placed back to back in each compartment, and coal bunkers are arranged athwartship and longitudinally in the wings in each compartment. The working pressure of the boilers is 250 pounds per square inch, and the combined heating surface is 74,800 square feet, and the grate area 2150 square feet. The boilers are fitted with the necessary apparatus for burning oil fuel as well as coal. Twenty-four fans of the single inlet type are provided for supplying the necessary air to the furnaces. In each boiler room there are one main and one auxiliary direct-acting feed pump, one See's ash ejector, and two air compressors for sweeping boiler tubes and supplying air to the furnaces, and a steam ash hoist. The boilers, funnels, and much of the auxiliary machinery were put on board while the vessel was on the stocks. This practice, now generally adopted at Elswick, confers the great advantage that the decks can be completed and much of the internal work advanced further than could otherwise be the case.

A complete installation of distilling and evaporating plant, by Messrs. J. Kirkaldy & Co., Limited, is fitted in a separate compartment, the capacity of the plant being 400 tons per day. In addition to the usual ladder-ways for communication between the various decks and the engine and boiler compartments, an electric lift is provided in each compartment; and for conveying orders from the engine rooms to the boiler rooms and other

parts of the ship a complete system of telephone and voice pipes is fitted, in addition to the mechanical and electrical telegraphs. A thoroughly up-to-date workshop is provided and fitted with the highest-class machine tools, which would enable ordinary repairs being carried out on board ship. —*Engineering.*

RADIO.

RADIO-TELEPHONY.—The Italian Military School of Radio-Telephony, instituted a few years ago by the present heads of the Admiralty and War Office, has been lately conducting a preliminary series of experiments under the auspices of the On. Leonardi Cattolica, Minister of Marine, for the utilization of persistent oscillations obtained by a discharger invented by Dr. Riccardo Moretti, and a microphone specially adapted by Professor Giuseppe Vanni. The results of these trials, which have demonstrated the possibility of transmitting words and music for a distance of 1000 kiloms., have induced the First Lord to equip a plant for service between Rome and Tripoli, and the two inventors have made over their rights to the state for purposes of national defence. Dr. Moretti, who is a Roman and is hardly twenty-six years old, is an example of nature breaking through the obstacles of an uncongenial education, for, though imbued with a passion for electrical research, he was induced by family reasons to dedicate himself to medicine and surgery, in which he took his degree. The fundamental difficulty which confronted him in the realization of his dream—the wireless transmission of sound—was the necessity of discovering a means for producing electric oscillations in which the discharges should follow each other with a frequency superior to that of the sonorous vibrations, and his problem was solved by the invention of his generator of continuous electric oscillations, and the first experiments successfully carried out between the Roman radio-telegraphic station and those of the Maddalena, Palermo and Vittoria have now been extended to Tripoli, where the officers have been able to recognize the voices of those speaking in the capital.—*The Engineer.*

AVIATION.

THE VALUE OF THE AEROPLANE FOR NAVAL USE.—The December number of the *Marine Rundschau* contains an instructive paper on the value of the aeroplane for naval use, the writer being Sub-Lieut. Friedensburg, a young officer who apparently is engaged in the aviation detachment of the navy. On the future of the flying machine for naval scouting he is frankly optimistic, and the publication of this view in the German Navy Department's magazine is not without significance. It accords with a report now in circulation to the effect that a thoroughly satisfactory hydroaeroplane has been built at the Putzig naval aerodrome, and that the type will be adopted as the standard for the German naval service. For military purposes the chief advantages of the aeroplane are as follows:

1. It can release a heavy weight without prejudicing its stability in the least.

2. Its smaller surface makes it practically invulnerable to attack from below even at a moderate altitude, and thus enables it to descend with safety to a range from which bombs can be dropped with considerable accuracy (from 500 to 1000 meters), as has been repeatedly proved by tests. From these heights a bomb weighing 55 pounds or 66 pounds, with a 60 or 70 per cent H. E. charge, would be very effective against a thinly armored or unprotected target.

3. In a duel between an airship and an aeroplane, the latter has the advantage of being able to change its altitude more rapidly, and would thus be able to attack the airship from above in comparative safety.

The science of throwing bombs or other missiles from an aeroplane is by no means difficult after some practice, and making allowance for the effect of wind. During the North Mark flying competition Herr Friedensburg, piloting a Harlan monoplane, dropped weighted messages in the

vicinity of the warships *Helgoland* and *Ostfriesland* from a height of 400 meters (1312 feet). It had been pre-arranged that the missiles should not strike the deck of the ship owing to the risk of casualties. The first weight fell one meter and the second 13 meters from the ship. The third message was dropped from a height of 1640 feet exactly on to a mark fixed on land. Hence, Herr Friedensburg concludes that, by the aid of a simple trap contrivance for releasing them, bombs may be dropped from aeroplanes on to land or sea targets with certain accuracy. But he very rightly attaches most importance to these machines as naval scouts, either with or without the assistance of wireless telegraphy, and records many practical demonstrations of their efficacy in this rôle. It has been found possible, for instance, to get a clear view of the sea over a radius of 66 nautical miles from an altitude of 3280 feet (1000 meters), which corresponds to the distance between Helgoland and the Western Ems estuary.

The author also points out the value of the aeroplane as a means of discerning objects beneath the surface of the water, such as mines or submarines. From a height less than 2000 feet objects 32 feet or more beneath the surface can be made out with ease.—*Naval and Military Record.*

AVIATION EXPERIENCE DURING THE WAR BETWEEN ITALY AND TURKEY.—The Italians found the airships and aeroplanes of some service though they did not realize what they expected. The Italians had four dirigible airships and about 20 aeroplanes, but the airships proved to be the only ones that were really effective. The dirigibles are named *P 1, P 2, P 3* and *M 1* (the letter *P* signifies balloons having a gas capacity of less than 4000 cubic meters the letter *P* standing for the word Piccolo, the larger dirigibles *M* have a capacity of about 12,000 cubic meters with a radius of action of about 500 knots with a speed of 25 knots and can also ascend to about 10,000 feet, but *M 1* is the only one of that type completed and that did not participate in the war.

The *P 2* and *P 3* were at Tripoli and made flights two or three times a week for several months. They served to reconnoiter the Turkish-Arabian positions and also to bombard their camps with satisfactory results. These dirigibles usually ascended to heights of from 3000 to 4000 feet and cruised for about three hours at a speed of from 20 to 25 knots. They met with some accidents, but the clever aviators managed to escape disaster.

The *P 2* was in the act of throwing bombs on the Turkish-Arabian camp at Asisieh when the motor suddenly stopped and the airship began to fall while exposed to the rifle fire of hundreds of the enemy. Fortunately the crew managed to repair the motor thus regaining control and after dropping several bombs flew out of range. *P 3* had a similar experience at Zuara. This dirigible had made a flight from Tripoli to Zuara and had replenished her supply of gas and oil from the ship *Hercules* when a sudden squall of wind carried the airship towards the beach where the Arabians were waiting to capture her. The gondola could not be steered and the situation was critical when the crew dropped an anchor that held the airship about a mile from the beach until the squall passed. The *P 1* was at Benghasi and rendered efficient service there with the Italian forces. The Italians were building another airship of the larger type —*M 2*—to be quartered in the big airship house building at Ferrara. Dirigibles *P 4* and *P 5* were being built.

Italians in North and South America contributed a sum of about $600,000 to provide Italy with airships sufficient for about 150 aeroplanes. One of these has been completed at Turin and is of a peculiar type. This is a dirigible airship with flat surfaces and built with small plates arranged like Venetian blinds, so that by opening and shutting the blinds the resistance of the air can be reduced. Experiments with this type were reported as satisfactory, but they were not used in the war.

The Italians had three Curtiss hydroplanes at Venice, but they were not ready for service during the war.—*Marine Rundschau* by W. H. B.

MISCELLANEOUS.

COMPLEMENTS OF MEN-OF-WAR.—The Japanese battleship *Fuso* will not only have the largest complement numbering 1350 persons, but it is also the largest battleship, having a displacement of over 30,000 tons and to be armed with 15-inch guns. This battleship is not yet completed, but the largest battleship now afloat, the Japanese ship *Kongo,* with 27,940 tons displacement, will have, according to English reports, a complement of 1200 men. The latest British battleships, *Lion, Princess Royal* and *Queen Mary,* having displacements of 27,000 tons, will have complements of 950, while the ships of *King George V* type will have 900 men. The German ships of 23,000 tons displacement have complements of from 1012 to 1107. The latest French battleships laid down this year will have complements of 1166 men with displacement tonnage of 23,500. The Russian battleships of *Gangut* class, 23,400 tons, will have complements of over 1000 men, while the Russian armored cruisers of 28,000 tons will have 1150 men. The Austrian battleship *Viribus Unitis,* of 20,000 tons, will have 980 men. The United States battleship *New York,* of 27,400 tons, will have 1014 men. Ships of the countries having compulsory service thus have the largest complements.—*From Internationale Revue ueber die gesammten Armeen und Flotten.*

DATA OF MEN-OF-WAR.—The tables (pp. 406-409) show in a convenient form what is being done by the several nations in their ships of war. One development noted is that the English service after long adhering to the 4-inch gun for torpedo-defence armament has adopted the 6-inch for her new constructions. The gun plans all follow our system, which is now predominant. The greatest departure in design during the past year has been shown in our *Oklahoma* class, by the discarding of medium armor protection. All other designs are tending now to follow this new principle. The gun calibers remain at the 13.5 and 14-inch. The tables were taken from *The Engineer* of January 24, 1912, but have been added to and corrected so as to accord with recent information.

DREADNOUGHTS OF EUROPE.—*Position in* 1914 *and* 1915.—Mr. Churchill, in reply to Lord Charles Beresford, who asked how many ships of the dreadnought type it was possible for Great Britain, Germany, Italy and Austria-Hungary to have on April 1, 1914, and April 1, 1915, and what were their names, stated that, on the assumption that the progress of the work on ships under construction remained normal and that there was no acceleration, the information asked for was as follows:

GREAT BRITAIN, APRIL 1, 1914.

1. Dreadnought.	11. Orion.	21. Benbow.
2. Bellerophon.	12. Monarch.	22. Indomitable.
3. Superb.	13. Thunderer.	23. Inflexible.
4. Téméraire.	14. Conqueror.	24. Invincible.
5. Collingwood.	15. King George V.	25. Indefatigable.
6. St. Vincent.	16. Centurion.	26. Lion.
7. Vanguard.	17. Ajax.	27. Princess Royal.
8. Neptune.	18. Audacious.	28. New Zealand.
9. Colossus.	19. Iron Duke.	29. Queen Mary.
10. Hercules.	20. Marlborough.	

ADD FOR APRIL 1, 1915.

30. Delhi.	32. Warspite.	34. Valiant.
31. Queen Elizabeth.	33. Barham.	35. Tiger.

NOTE.—The Australia and two Lord Nelsons have been omitted.

CAPITAL SHIPS LAID DOWN IN 1912

Name	Builder	Laid down	Normal displacement	Armament	H. P.	Speed	Machinery	Boilers	Builders of machinery
BRITISH—			*Tons*			*Knots*			
Iron Duke	PortsmouthYard.	January	26,000	10 13.5-in.A., 16 6-in., 5 21-in.t.t.	(?)	22	Parsons turbine	Babcock	Cammell, Laird
Marlborough	Devonport Yard.	January	26,000	10 13.5-in.A., 16 6-in., 5 21-in.t.t.	(?)	22	Parsons turbine	Yarrow	Hawthorn, L.
Delhi	Vickers	May	26,000	10 13.5-in.A., 16 6-in., 5 21-in.t.t.	(?)	22	Parsons turbine	Yarrow	Vickers
Benbow	Beardmore	June	26,000	10 13.5-in.A., 16 6-in., 5 21-in.t.t.	(?)	22	Parsons turbine	Babcock	Beardmore
Tiger	Clydebank	June	29,000	8 13.5-in.A., 16 6-in., 5 21-in.t.t.	100,000	31	Parsons turbine	Babcock	Clydebank
Queen Elizabeth	PortsmouthYard.	November	28,000*	8 15-in. (?), 6-in. (?) t.t.	(?)	25	Parsons turbine	Babcock	(?)
Warspite	Devonport Yard.	November	28,000*	8 15-in. (?), 6-in. (?) t.t.	(?)	25	Parsons turbine	Yarrow	(?)
CHILE—									
Al. Latorre	Elswick	June	28,000	10 14-in., 22 5-in., 4 21-in. t.t.	40,000	23	Parsons turbine	Yarrow	Vickers
FRENCH—									
Bretagne	Brest	July	23,550	10 13.4 in., 24 5.5 in., 4 18-in.t.t.	29,000	21	Parsons turbine	Belleville.	La Seyne
Lorraine	St. Nazaire	July	23,550	10 13.4 in., 24.5.5 in., 4 18-in.t.t.	29,000	21	Parsons turbine	Belleville.	St. Nazaire
Provence	Lorient	July	23,550	10 13-4 in., 24 5.5 in., 4 18-in.t.t.	29,000	21	Parsons turbine	Guyot	La Seyne
GERMAN—									
E. Brandenburg	Kiel Yard	(1912)	27,000*	† 8 14-in., 12 6-in., 6 22-in. t.t.	(?)	24	(?)	Schulz T.	
E. K. Augusta	Schichau-Danzig.	September	30,000*	† 8 14-in., 12 6-in., 6 22-in. t.t.	100,000	26.5	Parsons turbine	Schulz T.	Schichau
ITALIAN—									
Duilio	Castellamare	April	21,500	13 12-in., 18 6-in. (?) tubes	24,000	22.5	(?) T	Yarrow	Ansaldo
A. Doria	Spezia	March	21,500	13 12-in., 18 6-in. (?) tubes	24,000	22.5	(?) T	Yarrow	Ansaldo
JAPANESE—									
Haruna	Kawasaki Co.	March	27,500	8 14-in., 16 6-in., 8 21-in. t.t.	68,000	27	Curtis turbine	Miyabara.	Kawasaki
Kirishima	Mitsu Bishi Co.	March	27,500	8 14-in., 16 6-in., 8 21-in. t.t.	68,000	27	Parsons turbine	Miyabara.	Mitsu Biski
Fuso	Kure	March	31,300	10 14-in., 16 6-in. (?) t.t.	45,000	22.5	Parsons turbine	Miyabara.	(?)
RUSSIAN—									
Ismail	Galerni	December.	28,000	9 14-in., 20 4.7 in. (?) t.t.	(?)	27	(?) T	Yarrow	Baltic Works
Kinburn	Baltic Works	December.	28,000	9 14-in., 20 4.7 in. (?) t.t.	(?)	27	(?) T	Yarrow	Baltic Works
Borodino	Galerni	December.	28,000	9 14-in., 20 4.7 in. (?) t.t.	(?)	27	(?) T	Yarrow	Baltic Works
Navarino	Baltic Works	December.	28,000	9 14-in., 20 4.7 in. (?) t.t.	(?)	27		Yarrow	Baltic Works
SPANISH—									
Jaime I	Ferrol	February.	15,700	8 12-in., 20 4-in., 3 18-in. t.t.	15,500	19.5	Parsons turbine	Yarrow	Vickers, &c.
SWEDISH—									
Sverige	Gothenburg	(1912)	7,000	4 11-in., 8 6-in., 2 t.t.	20,000	22.5	(?) T	Yarrow	Gota Works
U. S. A.—									
Oklahoma	N.Y. Shipbuilding	June	27,500	10 14-in., 21 5-in. (?), 21-in. t.t.	35,000	20.5	Reciprocating	Babcock	N. Y. Shipbldg.
Nevada	Fore River Co.	June	27,500	10 14-in., 21 5-in. (?), 21-in. t.t.	35,000	20.5	Curtis turbine	Babcock	Fore River Co.

British "13.5 A" is reported to be really 14 in. See page 1643 of Proceedings, Dec., 1912, and page 1148 of Proceedings, Sept., 1912.
Fuso armament also reported as 8 15-in. *About. †Probably.

British "13.5 A" is reported to be really 14 in. See page [illegible]
Fuso armament also reported as 8 15-in.

*About. †Probably.

CAPITAL SHIPS LAUNCHED IN 1912

Name	Builder	Launched	Normal displacement	Armament, guns and torpedo tubes	H.P.	Speed	Machinery	Boilers	Builders of machinery
BRITISH—			*Tons*			*Knots*			
Ajax	Scott's	March	25,000	10 13.5-in., 20 4-in., 5 21-in. t.t.	31,000	21	Parsons turbine	Babcock	Scott's
Audacious	Cammell, Laird	September.	25,000	10 13.5-in., 20 4-in., 5 21-in. t.t.	31,000	21	Parsons turbine	Yarrow	Cammell, Laird
Queen Mary	Palmer	March	28,850	8 13.5-in., 16 4-in., 5 21-in. t.t.	80,000	28	Parsons turbine	Yarrow	Clydebank
Iron Duke	Portsmouth Yard.	October	26,000	10 13.5-in., 16 6-in., 5 21-in. t.t.	33,000	21	Parsons turbine	Babcock	.....
Marlborough	Devonport Yard.	October	26,000	10 13.5-in., 16 6-in., 5 21-in. t.t.	33,000	21	Parsons turbine	Yarrow	Hawthorne
AUSTRIAN—									
Teggetthof	Stab. Tecnico	March	20,000	12 12-in., 12 6-in., 4 21-in. t.t.	25,000	21	Parsons turbine	Yarrow	Stab. Tecnico
P. Eugen	Pola	November.	20,000	12 12-in., 12 6-in., 4 21-in. t.t.	25,000	21	Parsons turbine	Yarrow	Stab. Tecnico
FRENCH—									
Paris	La Seyne	Sept'b'r 28.	23,467	12 12-in., 22 5.5-in., 4 18-in. t.t.	28,000	21	Parsons turbine	Belleville	La Seyne
France	St. Nazaire	November.	23,467	12 12-in., 22 5.5-in., 4 18-in. t.t.	28,000	21	Parsons turbine	Niclausse	St. Nazaire
GERMAN—									
K. Albert	Schichau, Danzig.	April	24,500	12 12.2-in., 14 6-in., 8 22-in. t.t.	25,000	20–21	Parsons turbine	Schulz T	Schichau
P. R. Luitpold	Krupp	February	24,500	12 12.2-in., 14 6-in., 8 22-in. t.t.	25,000	20–21	Parsons turbine	Schulz T	Krupp
Seydlitz	Blohm and Voss	March	24,000	8 12.2-in., 14 6-in., 6 22-in. t.t.	68,000	25.5	Parsons turbine	Schulz T	Blohm and Voss
JAPANESE—									
Kongo	Vickers	May 18	27,500	8 14-in., 16 6-in., 8 t.t.	68,000	27	Parsons turbine	Yarrow	Vickers
Hi Yei	Yokosuka	November.	27,500	8 14-in., 16 6-in., 8 t.t.	68,000	27	Parsons turbine	Miyabara	.....
SPANISH—									
Espana	Ferrol	September.	15,700	8 12-in., 20 4-in., 3 18-in. t.t.	15,500	19.5	Parsons turbine	Yarrow	Vickers, etc.
U. S. A.—									
New York	New York Yard.	October	27,000	10 14-in., 21 5-in., 4 21-in. t.t.	28,100	21	Reciprocating	Babcock	Cramp
Texas	Newport News	May	27,000	10 14-in., 21 5-in., 4 21-in. t.t.	28,100	21	Reciprocating	Babcock	Newport News

SMALL SHIPS LAID DOWN IN 1912

Name	Builder	Laid down	Normal displacement	Armament	H.P.	Speed	Machinery	Boilers	Builders of machinery
BRITISH—			*Tons*			*Knots*			
Nottingham	Pembroke Yard	June	5400	9 6-in., 2 21-in. t.t	22,000	24.75	Parsons turbine	Yarrow	
Birmingham	Elswick	(1912)	5400	9 6-in., 2 21-in. t.t	22,000	24.75	Parsons turbine	Yarrow	
Lowestoft	Chatham Yard	June	5400	9 6-in., 2 21-in. t.t	22,000	24.75	Parsons turbine	Yarrow	
Brisbane	Sydney	(1912)	5400	9 6 in., 2 21-in. t.t	22,000	24.75	Parsons turbine	Yarrow	
Galatea	Beardmore	Decem.	About 3000	Not known			Parsons turbine	Yarrow	
Inconstant	Beardmore						Parsons turbine		
Royalist	Beardmore						Parsons turbine		
Undaunted	Fairfield						Brown Curtis t		
Penelope	Vickers						Parsons turbine		
Phaeton	Vickers						Parsons turbine		
Arethusa	Chatham Yard	Oct. 29					Brown Curtis t		
Aurora	Devonport Yard	Oct. 24					Brown Curtis t		
AUSTRIAN—									
Novara	Fiume	July	3500	9 4.1-in., 2 18-in. t.t	27,000	27	Parsons turbine	Yarrow	
BRAZILIAN—									
Javary	Vickers	August	1250	2 6-in., 2 4.7-in	(?)	11.5	Reciprocating	Yarrow	Vickers
Madeira									
Solimoes									
GERMAN—									
E. Irene	Weser, Bremen	(1912)	4700	12 4.1-in., 2 21-in. t.t	25,500	28	Diesel		Weser
E. P. Wilhelm	Kiel Yard	(1912)	4700	12 4.1-in., 2 21-in. t.t	25,500	28	Turbine	Schulz T	

NOTES.—Diesel motors to the Ersatz Irene are somewhat uncertain, and steam may be fitted after all. In any case it is doubtful whether more than part of the power will be from oil engines.

The Brazilian vessels are merely river monitors. All the others recorded are cruisers.

In addition to the ships mentioned, Russia, Spain, Turkey, and China are all reported to have laid down or ordered various small gunboats.

SMALL SHIPS LAUNCHED IN 1912

Name	Builder	Launched	Normal displacement	Armament	H.P.	Speed	Machinery	Boilers	Builders of machinery
BRITISH—			*Tons*			*Knots*			
Southampton	Clydebank	May	5500	8 6-in., 2 21-in. t.t.	22,000	26	Curtis Y	Yarrow	Clydebank
Dublin	Beardmore	April	5500	8 6-in., 2 21-in. t.t.	22,000	26	Parsons turbine	Yarrow	Beardmore
Fearless	Pembroke Yard	June	3360	10 4-in., 2 21-in. t.t.	18,000	25	Parsons turbine	Yarrow	Hawthorne
AUSTRIAN—									
Helgoland	Danubius Werft	November	3500	9 4-in., 2 18-in. t.	25,000	27	Parsons turbine	Yarrow	Danubius W.
Saida	Triest, W.C.N.	October	3500	9 4-in., 2 18-in. t.	25,000	27	Parsons turbine	Yarrow	Triest, W.C.N.
CHINESE—									
Fei Hung	N.Y. Shipbuilding	(1912)	2600	2 6-in., 4 4-in., 18-in. t.t.	6,500	20	Parsons turbine	Thornycroft	N.Y. Shipbldg.
DUTCH—									
Brinio	Amsterdam	(1912)	540	4 4.4-in	1,200	16	Diesel	Nil	.....
Friso	Amsterdam	(1912)	540	4 4.1-in	1,200	16	Diesel	Nil	.....
Gruno	Amsterdam	(1912)	540	4 4.1-in	1,200	16	Diesel	Nil	.....
GERMAN—									
Karlsruhe	Krupp	November	About 5000	12 4.1-in., 50 cal. 2 22-in. t.t.	25,000	28	Turbine	Schulz T.	Krupp
Rostock	Howalt	November	5000	12 4.1-in., 50 cal. 2 22-in. t.t.	25,000	28	Turbine	Schulz T.	Howalt
ITALIAN—									
Marsala	Castellamare Yard	March	3600	6 4.7-in., 2 18-in. t.t.	25,000	27	Parsons turbine	Blechynden	?
Libia	Ansaldo	November	3800	2 6-in., 8 4.7-in., 3 18-in. t.t.	12,000	22	Reciprocating	Niclausse	Ansaldo
Sebastiano Cabot	Palermo	(1912)	810	6 12-pdr	2,000	13	.....	.....	.....

GERMANY, APRIL 1, 1914.

1. Nassau.	8. Oldenburg.	15. Ersatz Weissenburg.
2. Westfalen.	9. Kaiser.	16. S.
3. Posen.	10. Friedrich der Grosse.	17. von der Tann.
4. Rheinland.	11. Kaiserin.	18. Moltke.
5. Helgoland.	12. König Albert.	19. Goeben.
6. Thuringen.	13. Prinzregent Luitpold	20. Seydlitz.
7. Ostfriesland.	14. Ersatz Kurfurst. (Friedrich Wilhelm.)	21. K.

ADD FOR APRIL 1, 1915.

22. Ersatz Brandenburg.	23. Ersatz Kaiserin Augusta.

ITALY, APRIL 1, 1914.

1. Dante Alighieri.	2. Conte di Cavour.	4. Guilio Cesare.
	3. Leonardo da Vinci.	

ADD FOR APRIL 1, 1915.

5. Duilio.	6. Andrea Doria.

AUSTRIA-HUNGARY, APRIL 1, 1914.

1. Viribus Unitis.	2. Tegetthoff.	3. Prinz Eugen.

ADD FOR APRIL 1, 1915.

4.—VII.

NOTE.—The Radetskys are omitted.

—*Naval and Military Record.*

NEW GYROSCOPIC COMPASS A SUCCESS.—A board of naval officers appointed to test the new gyroscopic compass, which was installed experimentally on the destroyer *Worden*, have found it to be remarkably free from oscillation due to the rolling and pitching of the vessel. Experiments which have been made with the same compass aboard a submarine show that it enables a helmsman to steer a more accurate course when the vessel is submerged.—*Scientific American.*

NAVAL EXPENDITURE OF THE GREAT POWERS.—A return of the naval expenditure of each of the eight principal naval powers—Great Britain, France, Russia, Germany, Italy, Austria-Hungary, the United States and Japan—has been issued as a Parliamentary paper. The return gives the total expenditure of the United Kingdom in each year since 1900, showing the interest on naval loans included in the estimates, the amount of expenditure out of naval loans, if any, and the appropriations-in-aid; the expenditure on new construction and armament, the amount of new construction expressed in tonnage in each of the years named, and the numbers of personnel; and it also gives for the same period similar information so far as it is available and appropriate for each of the foreign naval powers.

An explanatory memorandum states that in order to show the return on a common basis it has been found necessary to insert the amounts for new construction and armaments, as the sums actually expended are not ascertainable in all cases. The tonnage shown under "Amount of New Construction" is the tonnage, when completed, of the vessels launched during the several financial years. To effect a comparison between the naval expenditure of this country and of the other naval powers it will be necessary to eliminate from the total naval expenditure under Great Britain the expenditure relating to pensions, coastguard, reserves, and steamship subsidies, shown in an appendix, as there are no votes for these services in the foreign naval estimates, excepting those of France and Italy. In the case

of France pensions to other than flag officers are not provided for; flag officers, however, on reaching the age limit are placed on a reserve list, and the amount required for this service appeared in the personnel vote from 1901-1903 (inclusive). For each of the subsequent years a separate vote was included in the estimates. As regards Italy, part of the vote for the mercantile marine shown in an appendix apparently corresponds with the British vote for steamship subsidies. Another appendix shows certain expenditure provided for in the French, Russian, German, Italian and Japanese estimates for which there is no equivalent in the British naval estimates, except the amount included under Italy for premiums on navigation. Naval pensions in France, other than those mentioned above, are included in the budget of the Minister of Finance. As regards foreign countries, except in the case of Germany, there are no loans specifically for naval purposes.

The following tables give the figures for the last three years:

GREAT BRITAIN.

(Financial Year: April 1 to March 31.)

Year.	Naval expenditure.	Amount voted for new construction, including armament.	Amount of new construction (Tonnage when completed of vessels launched).	Nos. of Personnel.
	£	£	*Tons*	
1910-11.....	41,118,668	14,957,430†	176,582	130,817
1911-12*.....	44,882,047	17,566,877†	183,290	134,000
1912-13*.....	45,616,540	17,271,527	141,445	137,500

* Estimated. † Expenditure £14,755,289 and £15,059,881, respectively.

The gross total of naval expenditure excludes the annuity in repayment of loans under the Naval Works Acts, and includes (*a*) the expenditure out of loans under those acts, and (*b*) appropriations in aid.

FRANCE.

(Financial Year: January to December.)

1910*.....	15,023,019	4,977,682	21,860	58,595
1911*.....	17,370,906†	5,876,659	53,125	58,404
1912*.....	18,090,758‡	6,997,582	....	60,621

* Estimates as voted.
† In addition, supplementary estimates of £30,961 are proposed to cover expenditure due to Moroccan operations.
‡ Includes a sum of £1,117,032 for the three new battleships of the 1912 program and supplementary estimates of £42,569 for aviation.

RUSSIA.

(Financial Year: January to December.)

1910*.....	9,723,574	1,424,013	6,130	46,885
1911*.....	11,693,870	3,216,396	93,710	46,655
1912*.....	17,681,207†	6,829,320†	....	....

* Estimates as voted.
† This includes a sum of £759,687 (of which £494,062 is for new construction) towards the new program sanctioned by the Navy Law of June, 1912.

GERMANY.

(Financial Year: April to March.)

Year.	Naval expenditure.	Amount voted for new construction, including armament.	Amount of new construction (Tonnage when completed of vessels launched).	Nos. of Personnel.
1910–11.....	20,845,000	11,392,856	101,830	57,373
1911–12*.....	22,031,788	11,710,859	122,630	60,805
1912–13*.....	22,609,540	11,491,187†	....	66,783

* Estimates as voted. † Includes £97,847 for airships and experiments with airships.

ITALY.

(Financial Year; July to June.)

1910–11*.....	8,341,766	2,981,200	19,642	30,613
1911–12*.....	8,379,940†	2,677,302	80,289	30,587
1912–13*.....	8,566,505‡	....	....	33,095

*Estimates as voted.
† In addition, a sum of £68,000 is demanded in supplementary estimates for services of ships in Far East, and a sum of £1,480,000 for war expenses.
‡ In addition, a sum of £860,000 is demanded in supplementary estimates for war expenses, new construction, increase of personnel by 2,000 men, etc.

AUSTRIA-HUNGARY.

(Financial Year: January to December.)

1910.....	3,545,727	1,583,333	16,384	16,148
1911*.....	5,152,382	3,125,000	20,010	17,277
1912*.....	5,841,968	3,625,000†	....	17,581

* Estimates as voted. † Including £4,167 for aircraft.

The expenditure is gross.

UNITED STATES.

(Financial Year: July to June.)

1910–11.....	27,848,111	6,889,005	75,935	61,890
1911–12*.....	26,569,606	5,343,789	51,542	63,468
1912–13†.....	26,540,019	4,998,145	....	64,780

* Estimates as voted. † Estimates as proposed.

The expenditure is gross.

JAPAN.

(Financial Year: April to March.)

1910–11*.....	7,729,968	2,748,349	43,900	44,311
1911–12*.....	8,861,829	2,997,493	16,800	49,389
1912–13†.....	9,461,817	3,289,797	....	....

* Estimates as voted. † Estimates as proposed.

Miscellaneous Expenditure.—An appendix shows that the expenditure included in British naval estimates on pensions, coastguard, reserves, and steamship subsidies, for which no corresponding provision exists in the votes of foreign powers, excepting France and Italy, amounts to £4,038,900 in 1912-13. The estimated expenditure in 1912 under the navy votes of foreign powers, for which there is no equivalent in British naval estimates —such as pilot and lighthouse service, meteorological service, printing and books, secret service—is as follows: France, £821,523; Russia, £376,529; Germany, £692,207; Italy, £964,578, and Japan, £12,295.—*Army and Navy Gazette.*

ANNUAL REPORT OF THE SECRETARY AND TREASURER OF THE U. S. NAVAL INSTITUTE.

To the Officers and Members of the Institute:

Gentlemen:—I have the honor to submit the following report for the year ending December 31, 1912:

Itemized Cash Account.

Receipts for the Year 1912.

Items.	First Quarter.	Second Quarter.	Third Quarter.	Fourth Quarter.	Totals.
Dues	$211 67	$1,229 25	$230 00	$112 25	$1,783 17
Subscriptions	568 60	225 21	248 37	254 95	1,297 13
Extra Publications	8,244 57	9,094 11	4,104 45	10,433 46	31,876 59
Sale of Proceedings	39 39	74 68	39 24	34 38	187 69
Advertisements	46 59	301 03	27 60	260 46	635 68
Interest on money invested	596 25	737 61	543 75	747 29	2,624 90
Binding	4 91	18 70	6 60	3 30	33 51
Sundries	5 03	82 24	35 44	110 63	233 34
Totals	$9,717 01	$11,762 83	$5,235 45	$11,956 72	$38,672 01

DISBURSEMENTS DURING THE YEAR 1912.

Items.	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Totals.
Printing and binding Proceedings	$1,034 39	$1,154 57	$1,268 06	$1,202 09	$4,659 11
Printing and binding extra publications	4,497 71	3,619 08	1,896 55	3,528 73	13,542 07
Salaries	907 50	900 00	900 00	900 00	3,607 50
Contributors	307 50	813 00	480 50	766 00	2,367 00
Authors of text books	180 00	575 00	....	3,442 94	4,197 94
Postage and telegrams	151 51	172 53	175 79	137 88	637 71
Express, freight and hauling	23 32	23 90	23 58	18 03	88 83
Purchase of books for sale	208 87	58 62	4 33	13 40	285 22
Prize Essay award	213 95	....	....	....	213 95
Cost of drafts	75	....	....	25	1 25
Honorable Mention award	75 00	....	....	....	75 00
Notary Public fees	5 00	....	75	....	5 75
Stationery	39 40	114 84	29 55	22 35	206 14
Office expenses	20 00	3 20	3 30	8 00	34 50
Black & Co., Auditors	150 00	....	....	....	150 00
Subscriptions to magazines and Navy and Marine Corps Directory	4 50	....	3 32	1 71	9 53
Rent safe deposit box	....	5 00	....	....	5 00
Furniture	....	53 60	241 14	....	294 74
Engraving P. E. Medal	....	7 50	....	....	7 50
Discount on money order	....	....	17	....	17
Advertising in Trade List	....	....	15 00	....	15 00
Refunds	....	....	4 03	5 85	9 88
Salary for balance of year voted Professor Alger's widow	....	....	....	525 00	525 00
Meetings of Board of Control	....	....	....	93 00	93 00
Insurance on Institute property	....	....	....	80 00	80 00
Over credit of Manila check	....	....	....	2 00	2 00
Discount on Manila check	....	....	....	25	25
Purchase of New York City 4½% bonds	....	....	....	7,058 81	7,058 81
Totals	$7,819 40	$7,500 84	$5,046 07	$17,806 54	$38,172 85

SUMMARY.

Balance unexpended January 1, 1912	$12,601.66
Total receipts for the year 1912	38,672.01
	$51,273.67
Disbursements for the year 1912	38,172.85
Balance unexpended January 1, 1913	$13,100.82
Bills receivable for dues and binding	828.55
" " " subscriptions	103.12
" " " Proceedings	19.98
" " " advertisements	198.32
" " " extra publications	2,016.73
Value of back numbers of Proceedings	200.00
" " Institute property	300.00
" " extra publications	2,000.00
	$18,767.52
Liabilities	2,046.16
	$16,721.36

The balance ($13,100.82) unexpended January 1, 1913, is distributed as follows:

Seamen's Bank for Savings, New York	$3,000.00
Rhode Island Hospital Trust Co., Providence	3,047.72
Society for Savings, Hartford, Conn	3,092.26
Checks in safe, Institute office	327.99
Money orders in safe, Institute office	32.72
Cash in safe, Institute office	40.93
Farmers' National Bank, Annapolis	3,559.20
	$13,100.82

SECURITIES (BONDS) DECEMBER 31, 1912.

Southern Railway 5 per cent Registered Gold	$ 6,000.00
Washington Railway and Electric Co., 4 per cent	2,000.00
Northern Pacific and Great Northern Co., 4 per cent	18,000.00
Potomac Electric Power Co., 5 per cent	2,000.00
Northern Pacific, 3 per cent	12,000.00
Baltimore and Ohio ($6,963.14 of these bonds are the *Reserve Fund)	9,000.00
New York City, Registered, 4¼ per cent	7,000.00
	$56,000.00

* RESERVE FUND.—This, by the Constitution, is composed of the $3050 originally credited to it, together with all life-membership fees which have been or may hereafter be received, and the principal of this fund shall be held in perpetuity to guarantee the future interest of the life members. $6963.14.

The operations of the year 1912 show a net profit of $7557.16, of which amount $7000 was expended in the purchase of New York City 4¼ per cent bonds.

Respectfully,
RALPH EARLE, *Lieut.-Commander, U. S. Navy,*
Secretary and Treasurer.

The books of the Naval Institute have been examined from January 1, 1912, to December 31, 1912, and found to be correct, and the balance sheet verified.

A. B. HOFF, Commander, U. S. Navy,
L. M. NULTON, Commander, U. S. Navy,
E. J. KING, Lieutenant, U. S. Navy,
Auditing Committee.

BOOK NOTICES.

"Explosives: A Synoptic and Critical Treatment of the Literature of the Subject as Gathered from Various Sources." By Dr. H. Brunswig, translated and annotated by Charles E. Munroe and Alton L. Kibler, of the George Washington University. Published by John Wiley & Sons, New York, 319 pages, with an index of authorities and subjects.

The author, Dr. H. Brunswig, of Neubabelsburg, states in his preface that he has in this work gathered together the "actual facts recorded in the literature of explosives, arranged them in accordance with physical chemical views, and taken a survey of the present status of the chemistry of explosives and of its most important aims."

The whole general subject is placed here in an excellent manner and can be used as an authoritative reference work. The fact that two such eminent explosive authorities as Professors Munroe and Kibler have seen fit to translate and publish this work is sufficient proof of its value and reliability.

In view of the able way in which the material has been collected and put together the reader feels disappointed when he reads that it is made up solely from literature that is within the reach of everyone, and that the additional facts and material that the author knows from his own personal relations with the technique of explosives are not given, as his information and criticisms of methods now in use must be most valuable.

The exothermal reactions, sensitiveness, initial impulse, velocity of reactions, pressures and temperatures of explosives, together with the gases developed by explosions, explosions by influence and the flames from explosions are all treated in such a manner as to form a groundwork by which a student, from a study of the behavior of any explosive, can make a proper deduction.

A discussion of the velocity of propagation in explosive processes points out that deflagration under certain conditions such as rapidly rising pressure may go through all velocities to a detonation. A table of velocities shows the velocity of combustion of our nitrocellulose powder to rise from .08 cm. per sec. at one atmosphere pressure, to 18 cm. per sec. at 4000 atmospheres, the corresponding velocity of cordite being 49 cm. per sec. The influence of pressure on the variation of the velocity of combustion of cordite is smaller than in the case of nitrocellulose. This is stated to be a great advantage of the former over the latter type of powders.

The "brisance" of a reaction related essentially to the rate of increase of pressure is spoken of when the surrounding inert substances, which a relatively slowly increasing pressure of explosion would have moved forward as a whole or in large pieces and in a prescribed direction, lose their form entirely and are blown to fragments.

A table of the power of explosives shows that when measured according to "brisance" the order of the well-known high explosives is from high to low; nitromannite, gelatin dynamite, gun cotton, nitroglycerine, picric acid, mercury fulminate, collodion cotton, and explosive gelatine.

A table of the calculated temperatures of explosives shows that of cordite to be 2900° C. as against 1940° C. for nitrocellulose powders. Erosion tests are discussed at this time and the direct relation of the temperature of the explosion to the amount of erosion is brought out clearly.

The discussion of the gases from explosive reactions includes tables of the gases developed under varying pressures by explosives, particularly as to the presence of CO, CO_2, and CH_4.

The importance of the proper ignition of the powder charge in a gun is pointed out in this manner, "the character and intensity of an initial impulse influence the course of an explosive reaction to such a large extent that it has been said the effectiveness of an explosion depends more upon the initial impulse than upon the explosive itself."

Explosions by influence are illustrated by actual cases and the danger zones due to various great explosions are tabulated.

The value of the elimination of flame and the methods of accomplishing the same in the case of mine explosives are shown.

The most interesting part of the work is Part II, wherein characteristics of particular explosives, the propellants, and the blasting explosives are discussed.

The author states that nitrocellulose powder, when made with the proper care and of properly purified materials, is very stable. The Gaudin powder inquiry commission in France has just reported that the sole trouble with their powder was the lack of care and the use of impure materials. This has already been pointed out in the PROCEEDINGS on page 1281 of No. 140, Vol. 37.

Tables are given showing the class, characteristics, designation, and composition of important explosives and safety explosives, which are very valuable, interesting, and useful for reference.

This work forms a valuable modern addition to explosive literature.

RALPH EARLE.

"Die Flagge (The Flag): A history of the development of the flags used for signalling and saluting aboard ships of war and of commerce." By Vice Admiral R. Siegel, Imperial German Navy, published by the authority of the State Secretary of the Imperial Navy Office (Secretary of the Navy); with 48 colored plates containing more than 700 flags of 7 centuries in their original colors, 16 plates, and 74 drawings in the text; published by Dietrich Reimer (Ernst Vohsen), Berlin. Price 25 marks (six dollars).

"They that go down to the sea in ships, that do business in great waters" will find this book of great interest both as a history and as a work of art. It is evidently a work of love, for nothing short of an immense enthusiasm could have sustained the author while culling his material from so many sources. It is a pictorial history of the development of a ship; and reproduces many interesting paintings and seals. It contains sailing directions, fleet organization, fighting instructions, signals by voice, trumpet, flags and lights; in short it is an admirable epitome of the history of maritime affairs from ancient times to the present day.

In his preface, the author states that, as far as he knows, his subject has not yet found coherent treatment. Monograms and special works on the flag have appeared, but they relate, at best, only to certain periods of time, or to single countries; and do not deal with the subject from a comprehensive point of view. The history of the flag is a part of the history of maritime affairs. The flag is an important external symbol of the origin and character of the ship; and fulfills many purposes in signalling.

As the records of remote ages are few and untrustworthy, the author considers the flag of ancient times and of the earlier middle ages only at sufficient length to establish a basis and a starting point for the proper handling of his material. He, more or less arbitrarily, takes the year 1100, A. D., as the starting point. From this time on, information, though still meager and scattered, about ships and their appurtenances, becomes more available; and the flag is mentioned more frequently. Chronicles and annals busy themselves somewhat more than formerly with maritime affairs, which took on an increased importance as the result of the growth of the maritime cities of the Mediterranean, and the foundation and development of maritime trading places in Northern Europe.

The development of signalling is followed up to the adoption of the International Signal Book by the seafaring nations in the second half of the 19th century. This book marks the highest development of signalling with flags, at least for merchant ships and international intercourse. With reference to the use of flags for signalling by ships of war, each nation, as a result of its own experience, has adopted special principles, the application and improvement of which are changed as needed.

The author's field is so vast that he has had to restrict his work to a description of the general development of the flag, including a comprehensive account of the flags of those maritime states which have had the most influence on the improvement and use of the flag; that is, England, Holland, France, the Italian maritime cities, Spain and Portugal. The flags of other nations, however, receive adequate attention.

The earliest picture we have of a ship flying a flag appears on a vase taken from the sepulcher, probably of Libian origin, of an inhabitant of the Nile Valley prior to the coming of the nation we call Egyptian. The date of the origin of the vase is taken to be from 5000 to 6000 years B. C. A naval scene is pictured, showing two boats, with short oars for pulling, and long oars for steering. Amidships, each boat, which curves upward very noticeably both at the bow and stern, has two large superstructures, connected by a bridge at the after end of which there is a flag flying from a staff. Investigation has proved that the design represents boats and flags. Similar figures have been found, not only on vases, but also on the sepulchers themselves.

The 14th century was an important one in the history of the development of the flag. The sources which deal with the ship in general and its equipment in particular are more numerous; and it is, therefore, easier to follow the development of the flag; and, in addition, alongside of its use as a display ashore or as a personal distinction, the flag is used for signal purposes. It is clear that the command of a large number of ships is only

possible when the commander has some means of conveying definite information and issuing orders to separate ships or groups which are at a distance from him. If, generally, one limited himself to the use of the voice or a trumpet, and, in addition, made use of boats or small, speedy vessels, there must have been many occasions when these methods failed. Signals were, therefore, invented, that is, definite displays of flags by day and of lights at night. The regulations regarding signals, were, at first, insufficient, and often ambiguous; and the number of signals was very small. They dealt chiefly with cruising and night conditions; for, during the day, trust was placed in the practiced eyes of the seamen, who had to act according to circumstances, and follow the example of the commander. Information about signals is also found in orders which include general instructions relating to the handling of a fleet, which are, after the "tactics" of the Emperor Leo VI, the Philosopher (from 886 to 911, A. D.), the first attempts to deal with naval—tactical, and maritime war questions. These instructions are important not only because of their antiquity but also because they were the first bud of the development witnessed by following centuries. One kind of instructions, chiefly for sailing ships, had its origin in the North of Europe; while the other kind, dealing with galleys, had its origin in the Mediterranean.

The "Black book of the Admiralty," a collection of ancient regulations relating to maritime affairs, appeared in the first half of the 14th century. It deals with the cruising order and the battle order, flag and light signals, the duties of the admiral during peace, the choice of his lieutenants and other officers, and the organization of the fleet.

The second Instructions, originating in the Mediterranean, relate to the Expedition of Count Amadeus VI of Savoy, who went from Savoy to Venice in February, 1366, in order to support the Greek Empire. In Venice he hired a fleet of galleys from Genoa, Venice and Marseilles. He cruised to Varna in the Black Sea, and back to Venice. This was the first time that the flag of Savoy appeared afloat. Before leaving Venice the Count issued Instructions for Navigation and for Battle. They deal with the division of the fleet, the order of battle, scouting service, landing and cruising discipline. Flag signals played an important part but night signals were even more comprehensive.

COMMANDER H. F. BRYAN, U. S. Navy.

"The Logs of the *Serapis-Alliance-Ariel*, under the Command of John Paul Jones, 1779-1780." Edited by John S. Barnes, late Lieut.-Commander, U. S. Navy, and published by the Naval Historical Society at New York, 247 Fifth avenue, 138 pages. Price ten dollars.

There are included full page engravings of Jones and the engagement of the *Bon Homme Richard* and the *Serapis*, the former being "the Moreau le Jeune portrait," while the latter is taken from a rare print and is exceptionally fine. The facsimiles of the log of the *Serapis*, the letter of Midshipman Groube, and the first page of the muster roll of the *Bon Homme Richard* are interesting.

The Foreword is of historical value, and the title suggests the interesting contents of the book. The gale which so nearly caused the loss of the

Ariel, a sloop of war carrying twenty-six 9-pounders, is described thus:

"Monday, October 9th, 1780.

"Begins with Heavy Gales, and a great Sea, shipped much Water the Ship under her Courses.

"At 6 P. M. Wore Ship. Sounded 50 fathom Water. Housed the Guns.

"At 7 Down Fore Top Mast & Mizen Stay Sails, Haulled up the Mizen.

"At 9 the Ship Water Logged, up Main Sail & Reefed him. At 10 Handed the Main Sail, the Gale still Increasing, sett the Chain Pumps to work, the Ship making much Water, At ½ past 11 Handed the Fore Sail, finding the Ship would not right let go the Lee Anchor, in 40 fathom, and Cut away the Fore Mast at 2 A. M. the Gale Increasing, the Ship making much Water Cut away Main & Mizen Masts, Hands Employed Pumping and, Clearing the Rack, —— —— the Ship then bringing up and Riding to her Anchor, with a Heavy Sea, ————"

The record of the previous day shows that at 9 p. m. the topgallant masts and yards were sent down and topsails furled.

The whole book proved very enjoyable as well as instructive reading.

RALPH EARLE.

"*Le Novik*, Journal Posthume du Lieutenant de Vaisseau André Pétrovitch Steer." By Commander de Balincourt. Published by Augustin Challamel, Rue Jacob 17, Paris. One volume 180 pages. Price 50 cents.

The book deals with the career of this well-known Russian cruiser and the fortunes of its crew during the Russo-Japanese War. The name Novik translated literally is Scout. It is divided into four parts: the actions off Port Arthur, where each day the cruiser sailed out from port braving mines and torpedoes, tormented the enemy, and then returned each time safely to port as if she enjoyed a supernatural protection; the battle of the Yellow Sea on August 10, 1904; the flight, the cruiser steering towards the north endeavoring to reach Vladivostok; the indecisive engagement with the *Tsushima*, after which she was run aground, and sunk on August 20, 1904, in shallow water by her own crew, at Korsakovsk at the southern extremity of the island of Saghalien, then Russian property, in order to prevent her certain capture by the Japanese; and the journey with the crew six hundred verstes—398 miles— through the thick and primeval forests of Saghalien. The energy and vigilance of Lieutenant Steer is fully demonstrated in the accomplishment of this journey without leaving behind a single sick member or straggler in spite of the thousand difficulties due to the terrain and climate, though they were totally unprepared for such an experience, and worn out by the severe campaign.

Commander Balincourt says that the more one studies the Russian Navy the more one esteems its personnel and feels the ingratitude of which they were the victims even in their fatherland. The recitals of Seminoff, Politofsky, and Steer are indeed testimonials to the courage, self-sacrifice and devotion to the cause of the Russian naval personnel.

The *Novik* is now the Japanese protected cruiser *Sutsuya* (or *Suouya*, the name being written in both ways). She was refloated in October, 1905. She has now but two funnels, one having been removed. Her armament is six 4.7-inch 45 caliber, six 3-pounders, and five above-water 18-inch torpedo

tubes. Her displacement is 3100 tons, I. H. P. is 18,600, length 348 feet, beam 39 feet, with a complete steel deck 1.2 to 2 inches thick.

RALPH EARLE.

"Fanning's Narrative. Being the Memoirs of Nathaniel Fanning, an Officer of the Revolutionary Navy, 1778-1783." Edited and annotated by John S. Barnes, late Lieut.-Commander, U. S. Navy. Published by the Naval Historical Society. 258 pages of very legible print. Copies can be obtained, for seven dollars each, on application to the Secretary, Mr. Robert W. Neeser, 247 Fifth avenue, New York.

This volume gives one an entertaining story of the life of a privateersman in the Revolutionary War, the cruising ground being the North Sea, the English Channel, the islands north of Scotland and the Irish Sea.

The following is a brief synopsis of the book: He is captured early from the privateer *Angelica* and imprisoned at the Forton Prison for thirteen months, and on being exchanged reaches Nantz and is commissioned by Commodore John Paul Jones a midshipman for duty on board the *Bon Homme Richard*. The description of the cruise, the character of the commodore, and the battle with the *Serapis* are the best the writer has read. The events at Texel, the experiences of the *Alliance*, the celebrated party given by the commodore on board the *Ariel* at Lorient, and the various escapades of the commodore in France are well described. Fanning next ships on a privateer from Morlaix called the *Count de Guichen*, is captured by the English, exchanged, and fits out the *Eclipse* privateer, and is appointed to command her with a commission as a lieutenant in the French Navy, captures several vessels, but is again taken, although his prizes reach Dunkirk safely and net him one thousand guineas, which he received on being again exchanged. He then takes a lugsail privateer of twenty-five tons, hires a crew of twenty-one and sails again, only to be captured two days later by an English frigate off the Downs. After unbelievably bad treatment on this vessel, the *Belle Poule*, a French squadron under Comte de Guichen captured the frigate and Fanning was released, and endeavored to fit out another privateer at Dunkirk, of which project the treaty of peace prevented the accomplishment. He found himself the possessor of twelve thousand guineas as the results of his privateering. After visiting Paris, the descriptions of which are worth reading, he reached America in November, 1783.

RALPH EARLE.

"Les Corsaires Dunkerquois et Jean Bart: Des origines a 1662." By Henri Malo, published by Mercvre de France, 26 Rue de Condé, Paris, France, paper bound, 429 pages with many historical engravings.

Those who read in the PROCEEDINGS for September, 1911, No. 139, the "American Privateers at Dunkerque" by the same author will be interested in this complete work that sheds much light on the careers of the so-called freebooters of the seas that hailed from Dunkerque, "Dunkerque, aigle de la mer," as Scarron writes.

LIST OF PRIZE ESSAYS.

1879.

Naval Education. Prize Essay, 1879. By Lieut.-Com. A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut.-Com. C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880.

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881.

The Type of (I) Armored Vessel, (II) Cruiser best suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882.

Our Merchant Marine: The Causes of its Decline and the Means to be taken for its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. J. Kelley, U. S. N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut.-Com. F. E. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883.

How may the Sphere of Usefulness of Naval Officers be extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CULIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884.

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885.

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886.

What Changes in Organization and Drill are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U. S. N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORTS FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U. S. N.

1887.

The Naval Brigade: its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins.

1888.

Torpedoes. Prize Essay, 1888. By Lieut.-Com. W. W. Reisinger, U. S. N.

1891.

The Enlistment, Training and Organization of Crews for our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U. S. N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U. S. N.

1892.

Torpedo-boats: their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894.

The U.S.S. Vesuvius, with Special Reference to her Pneumatic Battery. Prize Essay, 1894. By Lieut.-Com. Seaton Schroeder, U. S. N.

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U. S. N.

1895.

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut.-Com. Richard Wainwright, U. S. N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U. S. N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U. S. N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U. S. N.

1896.

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U. S. N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U. S. N.

NAVAL APPRENTICES, INDUCEMENTS, ENLISTING AND TRAINING. The Seaman Branch of the Navy. Honorable Mention, 1896. By Ensign Ryland D. Tisdale, U. S. N.

THE COMPOSITION OF THE FLEET. Honorable Mention, 1896. By Lieutenant John M. Ellicott, U. S. N.

1897.

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U. S. N.

A PROPOSED UNIFORM COURSE OF INSTRUCTION FOR THE NAVAL MILITIA. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U. S. N. I.

TORPEDOES IN EXERCISE AND BATTLE. Honorable Mention, 1897. By Lieutenant J. M. Ellicott, U. S. N.

1898.

Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U. S. N.

OUR NAVAL POWER. Honorable Mention, 1898. By Lieut.-Com. Richard Wainwright, U. S. N.

TARGET PRACTICE AND THE TRAINING OF GUN CAPTAINS. Honorable Mention, 1898. By Ensign R. H. Jackson, U. S. N.

1900.

Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U. S. N.

THE AUTOMOBILE TORPEDO AND ITS USES. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U. S. N.

1901.

Naval Administration and Organization. Prize Essay, 1901. By Lieutenant John Hood, U. S. N.

1903.

Gunnery in Our Navy. The Causes of its Inferiority and Their Remedies. Prize Essay, 1903. By Professor Philip R. Alger, U. S. N.

A NAVAL TRAINING POLICY AND SYSTEM. Honorable Mention, 1903. By Lieutenant James H. Reid, U. S. N.

SYSTEMATIC TRAINING OF THE ENLISTED PERSONNEL OF THE NAVY. Honorable Mention, 1903. By Lieutenant C. L. Hussey, U. S. N.

OUR TORPEDO-BOAT FLOTILLA. The Training Needed to Insure its Efficiency. Honorable Mention, 1903. By Lieutenant E. L. Beach, U. S. N.

1904.

The Fleet and Its Personnel. Prize Essay, 1904. By Lieutenant S. P. Fullinwider, U. S. N.

A PLEA FOR A HIGHER PHYSICAL, MORAL AND INTELLECTUAL STANDARD OF THE PERSONNEL FOR THE NAVY. Honorable Mention, 1904. By Medical Inspector Howard E. Ames, U. S. N.

1905.

American Naval Policy. Prize Essay, 1905. By Commander Bradley A. Fiske, U. S. N.

THE DEPARTMENT OF THE NAVY. Honorable Mention, 1905. By Rear-Admiral Stephen B. Luce, U. S. N.

1906.

Promotion by Selection. Prize Essay, 1906. By Commander Hawley O. Rittenhouse, U. S. N.

THE ELEMENTS OF FLEET TACTICS. First Honorable Mention, 1906. By Lieut.-Com. A. P. Niblack, U. S. N.

GLEANINGS FROM THE SEA OF JAPAN. Second Honorable Mention, 1906. By Captain Seaton Schroeder, U. S. N.

THE PURCHASE SYSTEM OF THE NAVY. Third Honorable Mention, 1906. By Pay Inspector J. A. Mudd, U. S. N.

1907.

Storekeeping at the Navy Yards. Prize Essay, 1907. By Pay Inspector John A. Mudd, U. S. N.

BATTLE REHEARSALS. A few thoughts on our next step in Fleet-Gunnery. First Honorable Mention, 1907. By Lieut.-Comdr. Yates Stirling, U. S. N.

THE NAVAL PROFESSION. Second Honorable Mention, 1907. By Commander Bradley A. Fiske, U. S. N.

1908.

A Few Hints to the Study of Naval Tactics. Prize Essay, 1908. By Lieutenant W. S. Pye, U. S. N.

THE MONEY FOR THE NAVY. First Honorable Mention, 1908. By Pay Inspector John A. Mudd, U. S. N.

THE NATION'S DEFENSE—THE OFFENSIVE FLEET. How Shall We Prepare It for Battle? Second Honorable Mention, 1908. By Lieut.-Commander Yates Stirling, U. S. N.

1909.

Some Ideas about Organization on Board Ship. Prize Essay, 1909. By Lieutenant Ernest J. King, U. S. N.

THE NAVY AND COAST DEFENCE. Honorable Mention, 1909. By Commodore W. H. Beehler, U. S. N.

THE REORGANIZATION OF THE NAVAL ESTABLISHMENT. Honorable Mention, 1909. By Pay Inspector J. A. Mudd, U. S. N.

A PLEA FOR PHYSICAL TRAINING IN THE NAVY. Honorable Mention, 1909. By Commander A. P. Niblack, U. S. N.

1910.

The Merchant Marine and the Navy. Prize Essay, 1910. By Naval Constructor T. G. Roberts, U. S. N.

THE NAVAL STRATEGY OF THE RUSSO-JAPANESE WAR. Honorable Mention, 1910. By Lieutenant Lyman A. Cotten, U. S. N.

1911.

Navy Yard Economy. Prize Essay, 1911. By Paymaster Charles Conard, U. S. N.

NAVAL POWER. Honorable Mention, 1911. By Captain Bradley A. Fiske, U. S. N.

WANTED—FIRST AID. Honorable Mention, 1911. By Commander C. C. Marsh, U. S. N.

1912.

Naval Might. Prize Essay, 1912. By Lieutenant Ridgely Hunt, U. S. N. (retired).

INSPECTION DUTY AT THE NAVY YARDS. Honorable Mention, 1912. By Lieut.-Commander T. D. Parker, U. S. N.

1913.

The Greatest Need of the Atlantic Fleet. Prize Essay, 1913. By Lieut.-Commander Harry E. Yarnell, U. S. N.

NAVY DEPARTMENT ORGANIZATION. A Study of Principles. First Honorable Mention, 1913. By Commander Yates Stirling, Jr., U. S. N.

TRAINED INITIATIVE AND UNITY OF ACTION. Second Honorable Mention, 1913. By Lieut.-Commander Dudley W. Knox, U. S. N.

NOTICE.

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It now enters upon its fortieth year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII.

Sec. 1. The Institute shall consist of regular, life, honorary, and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control, and a vote equal to one-half the number of regular and life members, given by proxy or presence, shall be cast, a majority electing.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control, and, if their report be favorable, the Secretary and Treasurer shall make known the result at the next meeting of the Institute, and a vote shall then be taken, a majority of votes cast by members present electing."

The PROCEEDINGS are published quarterly and anyone may subscribe for them. The annual subscription is $3.00; single copies, 75 cents. Annual dues for members and associate members, $2.00. Fee for life membership, $30.00.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE.

NAVAL INSTITUTE PRIZE ESSAY, 1914.

A prize of two hundred dollars, with a gold medal, and a life-membership in the Institute, is offered by the Naval Institute for the best essay presented on any subject pertaining to the naval profession.

On the opposite page are given suggested topics. Essays are not limited to these topics and no additional weight will be given an essay in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. The award for the prize will be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay in a sealed envelope to the Secretary and Treasurer on or before January 1, 1914. The name of the writer shall not be given in this envelope, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary and Treasurer, with the motto on the outside and writer's name and motto inside. This envelope is not to be opened until after the decision of the Board.

3. The successful essay to be published in the PROCEEDINGS of the Institute; and the essays of other competitors, receiving honorable mention, to be published also, at the discretion of the Board of Control; and no change shall be made in the text of any competitive essay, published in the PROCEEDINGS of the Institute, after it leaves the hands of the Board.

4. If, in the opinion of the Board of Control, the best essay presented is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention" or such other distinction as the Board may decide.

5. In case one or more essays receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

6. Any essay not having received honorable mention may be published also, at the discretion of the Board of Control, but only with the consent of the author.

7. The essay is limited to fifty (50) printed pages in the PROCEEDINGS of the Institute.

8. All essays submitted must be either typewritten or copied in a clear and legible hand.

9. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

RALPH EARLE,

Lieut.-Commander, U. S. N., Secretary and Treasurer.

SUGGESTED PRIZE ESSAY TOPICS.

(a) "The Proper Organization and Administration of the National Fleet for the Conduct of a Great Campaign."

(b) "Theory vs. Practice in Naval Tactics."

(c) "Progressive Education of Naval Officers: A Discussion of the Requirements of (a) The Midshipman and the Naval Academy, (b) The Commissioned Officers and the Postgraduate and Specialty Courses, (c) Commanding and Flag Officers and the War College."

(d) "Is Our Present Training Service Adequate?"

(e) "Morale."

(f) "The Principles of Command."

NOTICE TO MEMBERS.

More members, both regular and associate, are much desired. Any increase in membership invariably means

NOTICE TO MEMBERS.

More members, both regular and associate, are much desired. Any increase in membership invariably means a larger number of papers and essays submitted, and consequently an improvement in the PROCEEDINGS.

You are requested to send or give the attached slip to some one eligible for membership, urging him to join.

By direction of the Board of Control,

RALPH EARLE,
Secretary-Treasurer.

CONSTITUTION, Art. VII, Sec. 8.—"The annual dues for regular and associate members shall be two dollars, payable upon joining the Institute and upon the **FIRST DAY OF EACH SUCCEEDING JANUARY.** The fee for life membership shall be thirty dollars." There is no initiation fee.

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.....*191*

To the Secretary and Treasurer,
U. S. Naval Institute,
Annapolis, Md.

Dear Sir:

Please enroll my name as a regular member of the U. S. Naval Institute from this date.

Very truly yours,

.....

.....

Dear Sir:

Please send my name as a regular member of the U.S. Naval Institute from this date.

Enclosed is my check for $_____ in payment of dues to _____, 19__.

Signature

Address

To the Secretary and Treasurer,
U.S. Naval Institute,
Annapolis, Md.

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Proceedings

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The writers only are responsible for the contents of their respective articles.

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U. S. NAVAL INSTITUTE.

SECRETARY'S NOTES.

War College Study.

The following list of books is suggested by the War College as preliminary to a more extended course of reading when opportunity offers. Many similar lists could be suggested, but it is believed that these books will prove not only as interesting as any, but will serve to give a general idea of the nature and extent of the knowledge that is essential to success in war. It is assumed that officers are familiar with the earlier works of Mahan, and with those of Daveluy and Darrieus that have been translated and published in the NAVAL INSTITUTE PROCEEDINGS:

The Brain of the Navy.....Wilkinson.
Naval Strategy .....Mahan.
Maritime Strategy .....Corbett.
Letters on Strategy.....Hohenlohe-Ingelfingen.
Modern War.....Derrécagaix.
On War .....Clausewitz.

Trained Initiative.

The attention of members, interested by the article by Lieut.-Commander Knox on "Trained Initiative and Unity of Action" in the last PROCEEDINGS, is called to "Psychology and the Navy," by Dr. Hugo Münsterberg which appears on page 159 of the *North American Review* for February, 1913. After a study of the question he judges that "the development of the last twenty years, as it is reflected in the German navy literature and in the spirit of the German navy officers, finds its real center in the persistent effort to create a strong sense of initiative and individual freedom in every man who is to fight on board of a man-of-war. Initiative and obedience ought to belong together in the psychology of the naval man the world over." This paper was read at the Naval College during summer of 1912.

Membership. Since February 20, 1913, 95 regular members, and 2 associate members have joined the Institute, and the following members have died:

Sir William White,
Lieutenant Richard Hill, U. S. N., and
Commander Gosta af Ugglas, R. S. N.

The net increase in membership since February 20, 1913, has thus been 94. The percentage increase since October, 1912, has been 30 and the total membership is now 1203. As there are 2251 officers on the active list it is hoped this rate of increase in membership will continue. The Institute is certainly a most valuable asset to an officer in his profession, as through it he keeps in touch with naval progress abroad, our own War College work, and our service opinion and thought on various professional topics.

We hope to reach a position where our membership will warrant the publication of the PROCEEDINGS every two months, should the members desire this change.

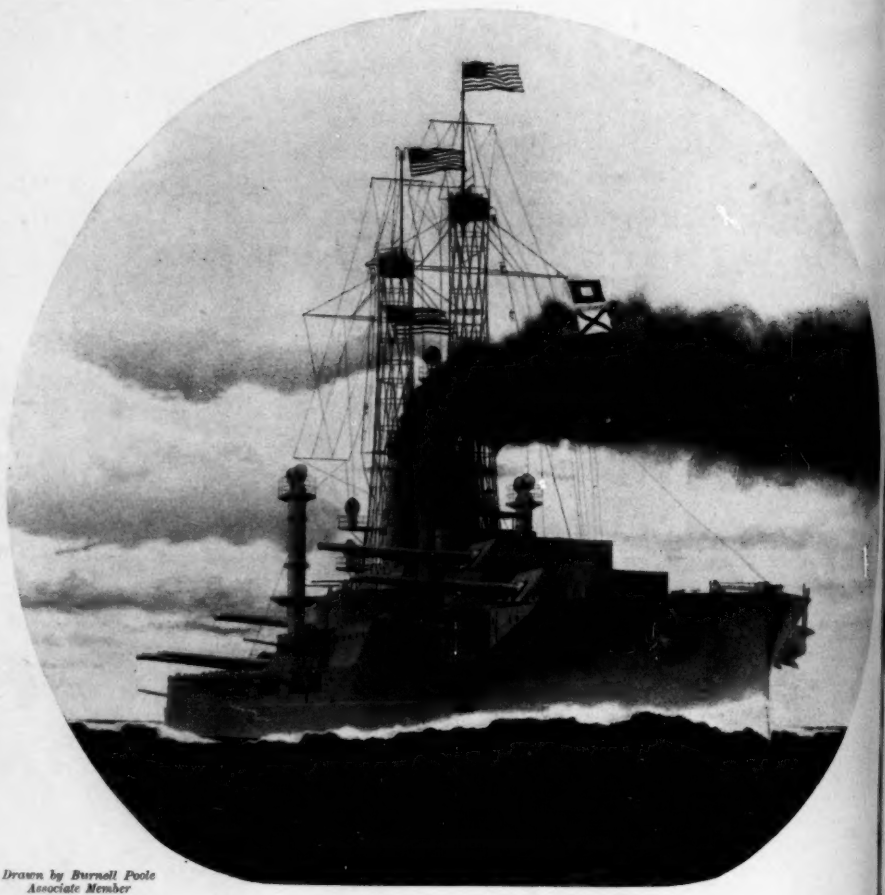
Sir William White. Sir William H. White, K. C. B., F. R. S., who was an associate member of the Institute died suddenly, February 27, in London from a paralytic stroke. Born in Devonport in 1845, he began his lifework by entering the Devonport Royal Dockyard as an apprentice shipwright. While there, in 1863, he won an Admiralty scholarship and entered the newly-established Royal School of Naval Architecture at South Kensington. Graduating from the school in 1867 with the highest honors, he entered the Admiralty immediately, and was promoted to the rank of Assistant Constructor in 1875, advanced to Chief Constructor in 1881. He was later associated for two years, from 1883 to 1885, with the warship building department of Armstrong & Company, after which he returned again to the Admiralty, becoming head of the Construction Department, holding the offices of Director of Naval Construction and Assistant Controller of the Royal Navy from 1885 to 1902, when his retirement became necessary on account of ill health. Subsequently on recovering his health he became director and consulting architect with Swan, Hunter & Wigham Richardson, designing and superintending the launching and construction of the Cunard liners "*Mauretania*" and "*Lusitania*." During seventeen years as the head of the Construction Department of the Admiralty

he was responsible for the design and construction of 245 vessels. Outside of his Admiralty work, Sir William White was for over ten years professor of naval architecture at the Royal School of Naval Architecture. He had served as president of most of the leading engineering societies in Great Britain, and many honors were bestowed upon him by universities and societies, both at home and abroad.

Krupp Works. Major Piorkowski has presented the Institute with two copies of "Krupp, A Century's History of the Krupp Works," the one in the original German and the other the English translation. The history comprises the years 1812 to 1912, and contains a progressive account of the development of this great ordnance concern.

A Correction. Ensign Edwards has requested that the date given on page 86 of his article "Steering Men-of-War by Electricity" be altered from November 15, 1912, to November 5, 1912.

ANNAPOLIS, MD., MAY 20, 1913.



Drawn by Burnell Poole
Associate Member

U. S. S. "FLORIDA" CLEARED FOR ACTION